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FINAL DRAFT
SITE INSPECTION REPORT
VI CHEMICAL
ST. CROIX, U.S. VIRGIN ISLANDS
VOLUME 1 OF 2

FIELD INVESTIGATION TEAM ACTIVITIES AT
UNCONTROLLED HAZARDOUS SUBSTANCES
FACILITIES — ZONE I

NUS CORPORATION
SUPERFUND DIVISION

100272

02-9101-04-SI
REV. NO. 0

FINAL DRAFT
SITE INSPECTION REPORT
VI CHEMICAL
ST. CROIX, U.S. VIRGIN ISLANDS
VOLUME 1 OF 2

PREPARED UNDER

TECHNICAL DIRECTIVE DOCUMENT NO. 02-9101-04
CONTRACT NO. 68-01-7346

FOR THE

ENVIRONMENTAL SERVICES DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 4, 1991

HALLIBURTON NUS ENVIRONMENTAL CORPORATION
SUPERFUND DIVISION

SUBMITTED BY:


ANTHONY F. CULMONE, JR.
PROJECT MANAGER


RICHARD M. SETTINO
SITE MANAGER

REVIEWED/APPROVED BY:


RONALD M. NAMAN
FACILITY OFFICE MANAGER

100273

PROJECT NOTE ON SITE INSPECTION ANALYTICAL RESULTS

This report contains analytical results from the site inspection sampling conducted by the Halliburton NUS Environmental Corporation on February 28, 1991 at the VI Chemical Site. The organic and inorganic analytical results have undergone data validation by Halliburton NUS Environmental Corporation personnel following U.S. EPA Region 2 data validation guidelines. At the time of this report only the inorganic data validation review had received U.S. EPA Region 2 final approval.

SITE SUMMARY AND RECOMMENDATIONS

The VI Chemical Site is a 3.5-acre facility located in the southwest portion of St. Croix, U.S. Virgin Islands. Over half of the facility is covered by buildings and/or process equipment (Ref. No. 12). Figures 1 and 2 provide a Site Location Map and a Site Map, respectively. Elevation of the site ranges from 10 to 40 feet above mean sea level and the topography slopes from south to north with an approximate 10-foot decrease in elevation. An intermittent stream, River Gut, which originates north of the site and discharges to the Caribbean Sea, borders the northern and eastern site boundaries. All surface runoff from the site flows to this gut. The surrounding area is predominantly commercial with five businesses located adjacent to the site and the closest residence located approximately 0.1 mile south. (Ref. Nos. 1, p. 2; 2, p. 1; 21).

The site is listed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) under two different names: Island Chemical Corp., EPA I.D. No. VID980651095 and VI Chemical, EPA I.D. No. VID988266268. Island Chemical Corp. also has McKesson Enviro-Systems and Safety Clean listed as aliases (Ref. No. 18).

The site property is currently owned by the Charles H. Steffey Holding Corporation. On May 1, 1969 the site was leased to Houston Chemical Industries, who on March 20, 1972 assigned the lease to Caribe Chemical Company, Inc. On June 30, 1978 Caribe Chemical Company, Inc., subsequently known as Pierrel America, Inc., assigned the lease to Cooper Laboratories, Inc. On July 21, 1978, Cooper Laboratories, Inc. incorporated Island Chemical Company as its subsidiary to assume its production activities at the facility. Island Chemical Company took over the lease on October 30, 1979 and on November 1, 1979, Cooper Laboratories sold all of its stock in Island Chemical Company to the predecessor of Berlex Laboratories, Inc. (a subsidiary of Schering-Berlin Inc.). On September 14, 1984, Berlex sold Island Chemical Company assets and assigned the lease to Virgin Island Chemical Company (VI Chemical). VI Chemical is now inactive and attempting to sell its assets and reassign the lease. In 1984, U.S. Resources and Chemicals, Inc. began leasing a portion of the property from VI Chemical. U.S. Resources then transferred the lease to VIAG Fuels, Inc. (VIAG), who still owns some process equipment on site (Ref. No. 1, pp. 2, 3). VIAG is rebuilding the facility but is not currently in production (Ref. No. 11). No past facility permit history is known.

The facility was believed to be used for the manufacture of pharmaceutical chemicals, primarily phenacetin, ethoxyquin, and quinidine, before 1980. Berlex reportedly used the facility to make quinidine gluconate, which was used for the production of quinine. Quinine is used as an anti-malarial agent and for flavoring in carbonated beverages. VI Chemical used the facility to produce benzyl acetate by reacting benzyl chloride with acetic acid. Benzyl acetate is used in perfumes, flavorings, resins, lacquers, polishes, printing inks, and varnish removers. In 1985, VI Chemical also began producing benzyl salicylate which is used as a perfume fixative, solvent for synthetic musk, sun-



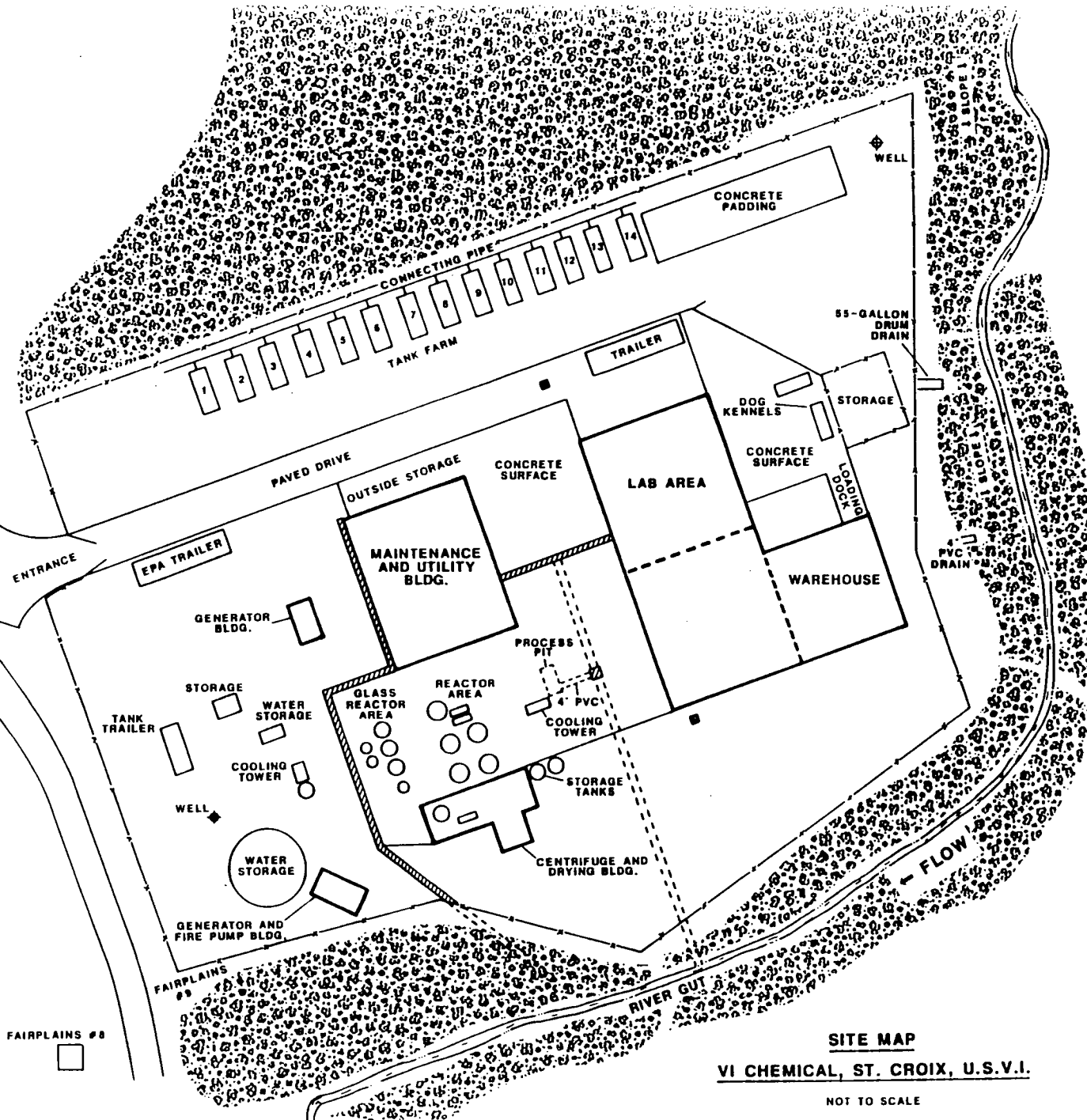
NUS
CORPORATION

VIPA #2

VIPA #1

100277

FAIRPLAINS #8



LEGEND
 ■ SEPTIC TANK
 --- STORM DRAINS
 [Stippled] VEGETATION

SITE MAP
VI CHEMICAL, ST. CROIX, U.S.V.I.

NOT TO SCALE

FIGURE 2



02-9101-04-S1
 Rev. No. 0

SITE SUMMARY AND RECOMMENDATIONS (CONTD)

screening lotion, and soap odorant. The facility was set up for batch and semicontinuous chemical manufacture (Ref. Nos. 1, p. 3; 2, p. 4). All outdoor storage tanks are reported to be empty of raw materials; however, there are conflicting reports as to whether or not one tank may contain an unknown amount of diesel fuel (Ref. Nos. 9, 11).

Prior to the sale of assets of Island Chemical Company to VI Chemical in October 1984, Enviro-Science, Inc. (ESI) was hired to investigate the site. Three areas of concern were determined during this investigation. Samples collected between September 1984 and March 1986 indicated the presence of various organic compounds, including elevated levels of toluene and pyridine, in on-site soils. All contaminated soil detected by ESI was reported to be either removed or treated on site using biodegradation through soil manipulation (Ref. No. 2, p. 12). Two separate Resource Conservation Recovery Act (RCRA) enforcement inspections were conducted at the site on September 9, 1985 and March 13, 1986 in order to verify the soil remediation and to determine RCRA compliance. Samples were collected on both occasions. The analytical results of these samples indicated the presence of phthalates, benzene, chloroform, and polynuclear aromatic hydrocarbons (PAHs) along with cadmium, chromium, and zinc; however, toluene limits were found to be acceptable. The facility was also found to be not in compliance since it discharged to River Gut without a National Priority Discharge Elimination System (NPDES) permit (Ref. Nos. 3, 4).

On January 31 and February 1, 1989, the U.S. EPA Response and Prevention Branch (RPB) conducted a preliminary assessment, site inspection, and removal site evaluation at VI Chemical. At that time the laboratory/warehouse building was found to contain approximately 400 drums, some being extremely deteriorated, leaking cylinders of chlorine and hydrogen chloride, and over 800 laboratory reagent containers that included sodium metal, potassium cyanide, and ethyl ether (Ref. No. 1). During the Halliburton NUS Environmental Corporation (formerly NUS Corp.) Region 2 FIT sampling site inspection on February 28, 1991 the laboratory/warehouse building was not entered; however, a number of overpack drums labeled "hazardous waste" were observed to be staged on the process area concrete pad. These were reported to have been placed there by RPB and are awaiting removal for off-site disposal. Since no other wastes are known to be present on site, there is no longer an imminent threat posed by fire/explosion. There is no imminent threat for direct contact because the site is completely fenced and has security guards present at all times (Ref. No. 9). RPB also collected samples from the on-site well and nearby public supply wells. The analytical results of these samples showed elevated concentrations of chloroform to be present in the groundwater in the area of the site (Ref. No. 23).

SITE SUMMARY AND RECOMMENDATIONS (CONTD)

Halliburton NUS Environmental Corporation conducted a sampling site inspection at the facility on February 28, 1991, during which six groundwater (collected from taps on the wells), six sediment, and four soil samples were collected. A number of the analytical results from these samples were rejected due to exceeded sample holding times; however, the data does indicate that chloroform was found in higher concentrations in the on-site (31 ug/L) and downgradient wells (12 ug/L) than in the upgradient wells (<10 ug/L). In addition, sediment samples from on-site storm drains indicate elevated levels of various organic and inorganic contaminants; including heavy metals. On-site soil and sediment samples also indicate the presence of a number of pesticides.

A **HIGHER PRIORITY FOR FURTHER ACTION** is recommended for the VI Chemical Site. A release to groundwater from the facility is observed in two public supply wells. The two public supply wells are located within 0.25 mile of the site and seven more are located within 0.5 mile of the site. These wells are part of a mixed system and together they supply approximately 11,500 people. Contaminants found in on-site soil and sediment samples may potentially release to surface water. Such a release could lead to wetland and fishery contamination.

SITE ASSESSMENT REPORT: SITE INSPECTION

PART I: SITE INFORMATION

1. Site Name/Alias VI Chemical/Island Chemical Corp./Berlex Laboratories, Inc./McKesson Enviro-
Systems/Safety Clean/Caribe Chemical Company, Inc./Cooper Laboratories/VIAG Fuels, Inc.
Street Route 66 (Melvin Evans Hwy)
City St. Croix State U.S. Virgin Islands Zip 00820
2. County Christiansted County Code 010 Cong. Dist. Unknown
3. EPA ID No. VID988266268
4. Block No. Plot 13 Q Lot No. N/A
5. Latitude 17° 42' 35" N Longitude 64° 47' 27" W
USGS Quad. Christiansted, Virgin Islands
6. Owner Charles H. Steffey Holding Corporation Tel. No. Unknown
Street 540 Baltimore Annapolis Blvd.
City Severna Park State Maryland Zip 21146
7. Operator VIAG Fuels, Inc Tel. No. (809) 778-4680
Street Route 66 (Melvin Evans Hwy)
City St. Croix State U.S. Virgin Islands Zip 00820
8. Type of Ownership
☒ Private ☐ Federal ☐ State
☐ County ☐ Municipal ☐ Unknown ☐ Other _____
9. Owner/Operator Notification on File
☐ RCRA 3001 Date _____ ☐ CERCLA 103c Date _____
☐ None ☒ Unknown
10. Permit Information

Permit	Permit No.	Date Issued	Expiration Date	Comments
<u>Unknown</u>	_____	_____	_____	_____
11. Site Status
☐ Active ☒ Inactive ☐ Unknown
12. Years of Operation May 1, 1969 to 1985

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13. Identify the types of waste sources (e.g., landfill, surface impoundment, piles, stained soil, above- or below-ground tanks or containers, land treatment, etc.) on site. Initiate as many waste unit numbers as needed to identify all waste sources on site.

(a) Waste Sources

Waste Unit No.	Waste Source Type	Facility Name for Unit
1	Lab/Warehouse Building	Lab/Warehouse Building
2	Aboveground Tanks	Tank Farm
3.	Below-ground Tank	Process Pit
4.	Below-ground Tanks	Lab Pits
5.	Contaminated Soil	Contaminated Soil
6.	Drum Storage Area	Drum Storage Area

(b) Other Areas of Concern

Identify any miscellaneous spills, dumping, etc. on site; describe the materials and identify their locations on site.

During the Halliburton NUS Environmental Corporation site inspection, approximately 22 drums labelled VIAG Diesel were located near the maintenance building. These drums were all in sound condition and the contents of the drums, if any, are unknown. A number of overpack drums were also observed to be located near the lab/warehouse building. Some of these were labelled Hazardous Waste. All of these drums are in sound condition and have been placed there by the U.S. EPA until they can be disposed of off site (Ref. No. 9). The production area of the site includes a stainless steel reactor area and a glass reactor area, along with a centrifuge and dryer building. Two generator buildings, cooling towers, two 4,000-gallon storage tanks, and a 250,000-gallon water storage tank are located in the southern and southeastern portions of the site (Ref. No. 2). The exact uses of these structures are unknown. There are no known reports of any spills or releases associated with any of these structures. Septic Tanks are used for all sanitary wastes from the facility. No process or laboratory wastes are connected to the septic system (Ref. No. 2; p. 3). There is conflicting reports as to the presence of diesel fuel on site; however, petroleum products are excluded under CERCLA/SARA and will not be evaluated in this report.

14. Information available from

Contact Amy Brochu Agency U.S. EPA Tel. No. (908) 906-6802
Preparer Richard M. Settino Agency Halliburton NUS Date September 4, 1991
Environmental Corp. Region 2 FIT

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit 1 - Lab/Warehouse Building

Source Type

<u> </u>	Landfill	<u> </u>	Contaminated Soil
<u> </u>	Surface Impoundment	<u> </u>	Pile
<u> X </u>	Drums	<u> </u>	Land Treatment
<u> X </u>	Tanks/Containers (compressed gas containers)	<u> X </u>	Other (Building)

Description:

The lab/warehouse building was the main building on site. It was used as an office and also housed a storage room, restrooms, a dryer area, and a worker cafeteria along with two analytical laboratories and a warehouse. During a U. S. EPA Region 2 Response and Prevention Branch (RPB) site inspection on February 1, 1989, a large number of drums, cylinders, and various laboratory containers were observed to be stored within this building. The condition of these containers was reported to range from fairly sound to extremely deteriorated. The deterioration of the containers was accelerated by flooding of the warehouse floor due to leaks in the roof of the building. The rain water on the floor allowed spilled materials in the building to mix and this accumulation of liquid was eventually discharged to the ground east of the lab/warehouse building. RPB reported the leaking warehouse roof had not affected the lab areas.

Hazardous Waste Quantity

RPB reported that the warehouse building contained approximately 400 drums, 130 of which were empty, along with several cylinders of gas. The laboratories were reported to have contained over 800 reagent containers. A complete RPB inventory for the building is included in Ref. No. 1. All of the hazardous materials have reportedly been removed from the lab/warehouse building. During the Halliburton NUS Environmental Corporation Region 2 FIT Sampling Inspection conducted on February 28, 1991, a number of overpack drums were observed to be outside of the building in the process area. These have been staged by RPB and are awaiting disposal off site.

Hazardous Substances/Physical State

A number of different hazardous substances were stored in the lab/warehouse building in solid, liquid and gaseous states. Some of the more hazardous materials include chlorine and hydrogen chloride gases, sodium metal, ethyl ether, and potassium cyanide stored near acids. Refer to Ref. No. 1 for a complete inventory of the substances found in the lab/warehouse building.

Ref. Nos. 1, pp. 2-4; 5; 9, p. 15

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PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit 2 - Tank Farm

Source Type

<u> </u>	Landfill	<u> </u>	Contaminated Soil
<u> </u>	Surface Impoundment	<u> </u>	Pile
<u> </u>	Drums	<u> </u>	Land Treatment
<u> X </u>	Tanks/Containers	<u> </u>	Other

Description:

A tank farm consisting of 14 aboveground tanks exists along the western border of the site. It is reported that 20 tanks were originally present; however, six of these were sold locally during the early 1980s. A 3-inch steel pipe runs along the rear of the tanks and connects to each of the tanks. There is a gate valve located on the north end of this pipe. The tank farm was used to store bulk raw materials for production.

Hazardous Waste Quantity

The tanks in the tank farm are reported to have a capacity of 8,000 gallons each. When Island Chemical Company (ICC) took over the facility in 1979, there were 6,900 gallons of xylene in a tank on site which was manifested as hazardous waste and shipped off site for disposal. When ICC shut down the facility in 1982, they reportedly manifested 28,600 gallons of toluene for disposal off site. In January 1989, RPB reported that four tanks were being used by VIAG Fuels, Inc. In 1989, three tanks contained ethanol and one contained diesel fuel while the remaining ten were empty. In 1991, there were conflicting reports stating that one tank may still contain an unknown amount of diesel fuel. The exact contents of these tanks prior to 1989 is unknown.

Hazardous Substances/Physical State

The tanks were originally used to store raw materials for the production process. These raw materials included quinine sulfate, toluene, diesel fuel, and methanol. The physical state of material contained in these tanks at anytime would be liquid.

Ref. Nos. 1, pp. 3-4; 2, pp. 3, 5; 5; 9, p. 15; 11

100283

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit 3 - Process Pit

Source Type

☐ Landfill	☐ Contaminated Soil
☐ Surface Impoundment	☐ Pile
☐ Drums	☐ Land Treatment
☒ Tanks/Containers	☐ Other

Description:

Wastewater from cooling during production operations was collected in an underground concrete process pit located beneath the concrete surface near the production area. Any wastes from spills in the process area were collected by concrete channels and also directed to this tank. The water in the tank was sampled to monitor for accidental product release and, if none occurred, was released to River Gut untreated via an underground pipeline composed of 55-gallon drums welded end to end. Any sludge present in the wastewater would settle out in the pit and also in the drainline. The pit was reported to have been cleaned out in 1982 when Berlex shut down operations, with sludge and wastewater being disposed of locally. The pit was cleaned out again in 1985 and subsequently sealed with concrete. The drainline from the pit was excavated by Enviro-Services, Inc. (ESI) in 1985 and was reported to have contained an oil sludge. This material was collected and the drainline was replaced with a 10-inch polyvinyl chloride (PVC) pipe.

Hazardous Waste Quantity

Available background information is conflicting with regard to the actual size of the pit, stating that it was 8,000 gallons and 17,000 gallons. The exact amount of waste removed from the pit is unknown; however, ESI reported to have removed thirteen 55-gallon drums of sludge from the excavated drainline.

Hazardous Substances/Physical State

Analytical data from samples collected by ESI in 1985 of water accumulated in the pit indicated elevated levels of benzyl chloride, zinc, cadmium, chromium, and lead. The physical states of the material found in the process pit and drainline were liquid and sludge.

Ref. Nos. 1, pp. 6, 7; 2, pp. 3, 4, 9, 10; 3, p. 3; 4, pp. 2, 3; 5

100284

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit	4	-	Lab Pits
Source Type			
	Landfill		Contaminated Soil
	Surface Impoundment		Pile
	Drums		Land Treatment
	Tanks/Containers	X	Other (Cobble-filled waste pits)

Description:

Laboratory wastes from both laboratories drained to a cobble-filled pit located below the concrete loading dock area west of the warehouse portion of the building. This pit was connected to a second cobble-filled pit near the fence by a 4-inch PVC pipe. Originally, laboratory drains were reported to flow directly from the building to the first pit, which at that time was an open pit. During the rainy season, this pit would fill with water and overflow to River Gut. Later, the pit was filled and the area was covered with concrete for use as a loading dock. It is unknown as to exactly how the laboratory drain was redirected to the pit near the fence., Figure 9 in Ref. No. 2 provides a drawing of the laboratory drain system. During excavation ESI broke the 4-inch PVC line near the loading dock. Although an immediate odor and readings in excess of 1,000 ppm on a flame ionization detector were detected, the pipe was dry, indicating no recent usage.

Hazardous Waste Quantity

The size of the pits as well as the amount of waste discharged from the laboratory drain is unknown.

Hazardous Substances/Physical State

Samples taken during two separate RCRA Enforcement Site Inspections in 1985 and 1986 indicated elevated levels of phthalates, chloroform, benzene, and toluene. The physical state of the waste from the laboratory was liquid. It is unknown if any solid or sludge was discharged from the drain to the pit.

Ref. Nos. 2, pp. 3, 7-9; 3, pp. 2-5; 4, pp. 1, 4, 5

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit 5 - Contaminated Soil

Source Type

<u> </u>	Landfill	<u> X </u>	Contaminated Soil
<u> </u>	Surface Impoundment	<u> </u>	Pile
<u> </u>	Drums	<u> </u>	Land Treatment
<u> </u>	Tanks/Containers	<u> </u>	Other

Description:

During the ESI site evaluation in September and October of 1984, four areas of soil contamination were detected. Areas of contaminated soil were detected under the concrete pad near the tank farm, between tanks 8 and 9, west of the warehouse near the lab pits, and along the original lab pit drain to River Gut. Contamination was detected from depths of one foot to three feet. ESI reported that all contaminated soil was either removed or treated on site.

Hazardous Waste Quantity

ESI reported that approximately 245 pounds of toluene and pyridine were found to be contained in the soil in the areas listed above. A number of other contaminants were detected in these soils. The toluene and pyridine contaminated soil was treated on site. The toluene contaminated soil was placed in a drying oven which volatilized the toluene from the soil. The soil contaminated with pyridine was tilled and rotated daily, which allowed the pyridine to be emitted to the ambient air. In both cases, the contaminant emission was controlled and did not exceed Threshold Limit Values for either substance. ESI also reported that approximately 225 drums of waste and soil containing other contaminants were shipped off site for disposal.

Hazardous Substances/Physical State

A number of substances were detected in the on-site soils before and after remediation was conducted, including toluene, pyridine, quinidine gluconate, quinine sulfate, fluorethyne, 2-methyl propanol, pentane, 2-methyl-1-heptene, diphenyl methanone, and xylene. The physical state of the wastes in the soil is liquid.

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit 6 - Outdoor Drum Storage Area

Source Type

☐	Landfill	☐	Contaminated Soil
☐	Surface Impoundment	☐	Pile
☒	Drums	☐	Land Treatment
☐	Tanks/Containers	☐	Other

Description:

A concrete pad in the northern portion of the site was reported to be used as a raw material storage area during facility operations. The concrete pad measured 50 feet by 20 feet (1,000 ft²) and was surrounded by a chain-link fence. It is unknown if the concrete was covered with an impermeable layer or if any berm existed in the storage area during operations.

Hazardous Waste Quantity

During the RCRA inspection in September 1985, one 55-gallon drum containing approximately 40 gallons of a water/toluene mixture was being stored in the area. The amount of material stored in this area during facility operations is unknown.

Hazardous Substances/Physical State

A toluene/water mixture was observed in this area during a RCRA inspection in 1985. Other substances that may have been stored here are unknown; however, reported raw materials used at the facility included quinine sulfate, toluene, and methanol. These would have been in a liquid state.

Ref. No. 3, p. 5

100287

PART III: SAMPLING RESULTS

EXISTING ANALYTICAL DATA

The VI Chemical Site and nearby wells have been sampled at various times from 1984 through 1990. Samples have been collected by Enviro-Services, Inc. (ESI), U.S. EPA Environmental Services Division (ESD), U.S. EPA Response and Prevention Branch (RPB), and Weston Region 2 Technical Assistance Team (TAT). The results of these sampling events indicate the following areas of contamination.

During a RCRA Enforcement inspection conducted by ESD on September 19, 1985 six composite samples were collected, two from the drying oven area and four from the lab waste drainage area. Samples collected from the drying oven area indicated the presence of toluene (560 micrograms per kilogram [ug/kg]), fluorene (9,200 ug/kg), bis(2-ethylhexyl) phthalate (13,000 ug/kg), benzophenone (15,000,000 ug/kg), and di-n-octyl phthalate. Samples from the lab waste drainage area indicate the presence of toluene (440 ug/kg), bis(2-ethylhexyl) phthalate (51,000 ug/kg), di-n-octyl phthalate (4,200 ug/kg), chloroform, benzene, and d-n-butyl phthalate (75,000 ug/kg) (Ref. No. 3, Table 1).

During a second RCRA Enforcement inspection conducted by ESD on March 3, 1986, samples were collected from the lab waste pit area, the lab waste pit seep, the drainage pit discharge, and the on-site well. A sample was also collected from River Gut to serve as a background sample. All samples indicated above background levels of di-n-octyl phthalate (17,000 ug/kg) and the sample collected from the drainage pit discharge indicated above background levels of xylene (470 ug/kg), 1,4-dichlorobenzene (870 ug/kg), 1, 2, dichlorobenzene (2,900 ug/kg), naphthalene (2,100 ug/kg), fluorene (2,000 ug/kg), phenanthrene (2,400 ug/kg), chromium (52 ug/kg), and lead. The on-site well sample indicated that bis(2-ethylhexyl)phthalate and chloroform were present at concentrations of 280 ug/kg and 130 ug/kg, respectively (Ref. No. 4, Table 2).

ESI sampling results from work conducted at the facility between September 1984 and March 1986 indicated that the soil between tanks 8 and 9 contained 690 parts per million (ppm) of toluene. Samples taken from borings in the loading dock area, which included the laboratory drain area, and surface soil samples from the lab drain discharge pathway to River Gut indicated the presence of pyridine (43,000 parts per billion [ppb]), quinidine gluconate, quinine sulfate, toluene, fluorethyne, 2-methyl propanol, pentane, 2-methyl-1-heptene, diphenyl methanone (64,000 ppb), and xylene (600 ppb). Samples collected from the Gut also revealed the presence of cadmium, chromium, and zinc at concentrations of up to 14 times above background levels (Ref. No.2, pp. 7, 8).

Water samples taken by RPB in October and November 1988 and by TAT in January and June 1990 from the on-site well and nearby public supply wells Fairplains Nos. 6, 8, 9 and VIPA Nos. 1 and 2 indicated the presence of chloroform in concentrations ranging from 2 to 75 micrograms per liter (Ref. No. 23).

Attached to the Preliminary Assessment Report, which is included as Ref. No. 5, is an inventory of laboratory reagents and drum contents which were found on the site property during a 1989 RPB Emergency Removal Action inspection.

SITE INSPECTION RESULTS

Halliburton NUS Environmental Corporation Region 2 FIT conducted a sampling site inspection of the VI Chemical facility on February 28, 1991. Figure 3 presents a Sample Location Map and Table 1 presents a summary of the analytical results of the samples. The complete data package for the samples collected is presented as Ref No. 16. A number of the results have been rejected since sample holding times were exceeded. These samples are appropriately marked and the site condition has been evaluated on only the remaining data. These data indicate elevated levels of chloroform in the on-site (31 ug/L) and two downgradient wells (12 ug/L). The data also indicate elevated levels of various metals in on-site storm drain sediments and elevated levels of pesticides in on-site soils and storm drain sediments.

● S6



GW6
VIPA #2

GW5
VIPA #1

LEGEND

- SEPTIC TANK
- //// STORM DRAINS
- ⊕ VEGETATION
- ⊕ GROUNDWATER SAMPLE
- SEDIMENT SAMPLE
- SOIL SAMPLE

FAIRPLAINS #8
GW4

SAMPLE LOCATION MAP

VI CHEMICAL, ST. CROIX, U.S.V.I.

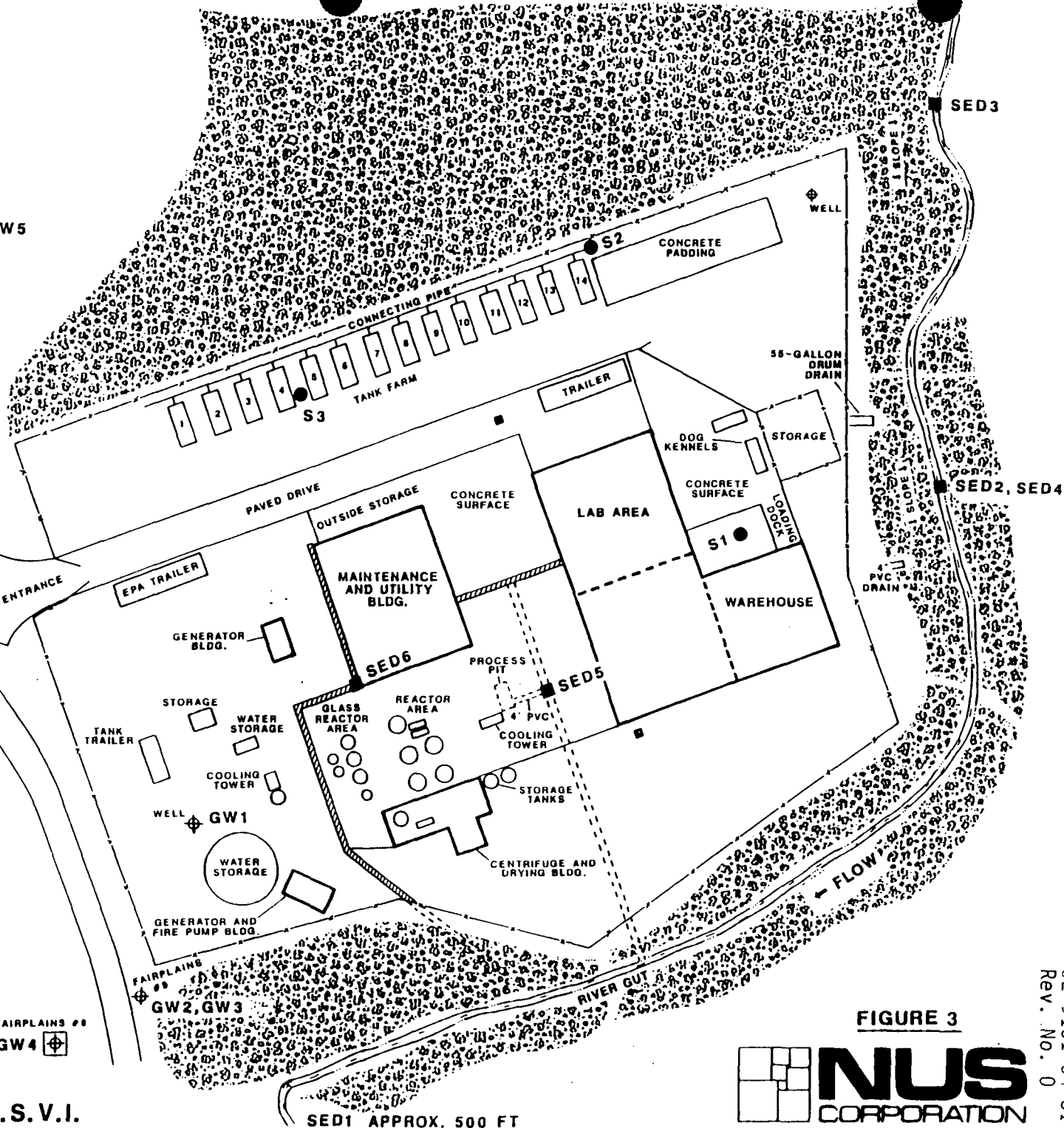


FIGURE 3

NUS
CORPORATION

02-9101-04-S1
Rev. No. 0

100289

SITE NAME: VI CHEMICAL
ID#: 02-9101-04
SAMPLING DATE: 2/26/91
EPA CASE NO.: 15933 LAE OMPUCHEM

TABLE 1
SITE INSPECTION SAMPLING RESULTS

08/06/91

VOLATILES

Sample ID No.	VI25-GW1(ME)	VI25-GW2	VI25-GW3(DUV)	VI25-GW4	VI25-GW5	VI25-GW6	VI25-SED1	VI25-SED2	VI25-SED3	VI25-SED4	VI25-SED5	VI25-SED6	VI25-S1(MS)	VI25-S2	VI25-S3	VI25-S6	VI25-R1W1
Traffic Report No.	BGL01	BGL02	BGL03	BGL04	BGL05	BGL06	BGL09	BGL10	BGL11	BGL12	BGL17	BGL16	BGL13	BGL14	BGL15	BGL23	BGL18
Matrix	WATER	WATER	WATER	WATER	WATER	WATER	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SOIL	SOIL	SOIL	SOIL	WATER
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Dilution Factor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Percent Moisture	--	--	--	--	--	--	27	33	43	34	19	42	16	16	18	9	--

Chloromethane																	
Bromomethane																	
Vinyl Chloride																	
Chloroethane																	
Methylene Chloride																	B
Acetone																	
Carbon Disulfide																	
1,1-Dichloroethene																	
1,1-Dichloroethane																	
Trans-1,2-Dichloroethene (all)																	
Chloroform	31	12	12	12	J												
1,2-Dichloroethane																	
2-Butanone											85 E	150				18 E	
1,1,1-Trichloroethane					J												J
Carbon Tetrachloride																	
Vinyl Acetate																	
Bromodichloromethane																	
1,2-Dichloropropane																	
cis-1,3-Dichloropropene																	
Trichloroethene																210 E	
Dibromochloromethane																	
1,1,2-Trichloroethane																	
Benzene																	
trans-1,3-Dichloropropene																	
Bromoform																	
4-Methyl-2-Pentanone																	
2-Hexanone																	
Tetrachloroethene																	
Toluene																	
1,1,2,2-Tetrachloroethane																	
Chlorobenzene																	
Ethylbenzene																	
Styrene																	
xylenes (Total)											86 E	J					

NOTES:

Blank space - compound analyzed for but not detected

B - compound found in lab blank as well as sample, indicates possible probable blank contamination

E - estimated value

J - estimated value, compound present below CRQL but above IDL

R - analysis did not pass EPA QA/QC

N - Presumptive evidence of the presence of the material

NR - analysis not required

Detection limits elevated if Dilution Factor > 1 and/or Percent Moisture > 10

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TABLE
SITE INSPECTION SAMPLING RESULTS
(cont'd)

SITE NAME: VI CHEMICAL
TODD: 02-9101-04
SAMPLING DATE: 2/28/91
EPA CASE NO.: 15933 LAB: COMPUCHEM

VOLATILES		
Sample ID No.	VI25-RIN2	VI25-TBLK1
Traffic Report No.	BGL19	BGL22
Matrix	WATER	WATER
Units	ug/L	ug/L
Dilution Factor	1	1
Percent Moisture	--	--
Chloromethane		
Bromomethane		
Vinyl Chloride		
Chloroethane		
Methylene Chloride	B	B
Acetone		
Carbon Disulfide		
1,1-Dichloroethene		
1,1-Dichloroethane		
Trans-1,2-Dichloroethene (Total)		
Chloroform		
1,2-Dichloroethane		
2-Butanone		
1,1,1-Trichloroethane	J	
Carbon Tetrachloride		
Vinyl Acetate		
Bromodichloromethane		
1,2-Dichloropropane		
cis-1,3-Dichloropropene		
Trichloroethene		
Dibromochloromethane		
1,1,2-Trichloroethane		
Benzene		
trans-1,3-Dichloropropene		
Bromoform		
4-Methyl-2-Pentanone		
2-Hexanone		
Tetrachloroethene		
Toluene		
1,1,2,2-Tetrachloroethane		
Chlorobenzene		
Ethylbenzene		
Styrene		
Xylenes (Total)		

NOTES

Blank space - compound analyzed for but not detected
B - compound found in lab blank as well as sample, indicates possible probable blank contamination
E - estimated value
J - estimated value, compound present below CRQL but above IDL
R - analysis did not pass EPA QA/QC
N - Presumptive evidence of the presence of the material
NR - analysis not required
Detection limits elevated if Dilution Factor >1 and/or percent moisture >0%

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SITE NAME: VI CHEMICAL
 ID#: 02-9101-04
 SAMPLING DATE: 2/28/91
 EPA CASE NO.: 15933 LAB: COMFICHEM

TABLE
 SITE INSPECTION SAMPLING RESULTS
 (cont'd)

SEMI-VOLATILES

Sample ID No.	VI25-GW1(MS)	VI25-GW2	VI25-GW3(DUV)	VI25-GW4	VI25-GW5	VI25-GW6	VI25-SED1	VI25-SED2	VI25-SED3	VI25-SED4(DVI)	VI25-SED5	VI25-SED6	VI25-S1(MS/	VI25-S2	VI25-S3	VI25-S6	VI25-RIN1
Traffic Report No.	BGL01	BGL02	BGL03	BGL04	BGL05	BGL06	BGL09	BGL10	BGL11	BGL12	BGL17	BGL16	BGL13	BGL14	BGL15	BGL23	BGL18
Matrix	WATER	WATER	WATER	WATER	WATER	WATER	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SOIL	SOIL	SOIL	SOIL	WATER
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Dilution Factor/GPC Cleanup (x)	1	1	1	1	1	1	1	1	1	1	1	4	1	1	1	1	1
Percent Moisture	--	--	--	--	--	--	27	33	43	34	19	42	16	16	18	9	--

Phenol	J	NR							R			R			R		R
bis(2-Chloroethyl)ether		NR							R			R			R		R
2-Chlorophenol		NR							R			R			R		R
1,3-Dichlorobenzene		NR							R			R			R		R
1,4-Dichlorobenzene		NR							R			R			R		R
Benzyl alcohol		NR							R			R			R		R
1,2-Dichlorobenzene		NR							R			R			R		R
2-Methylphenol		NR							R			R			R		R
bis(2-Chloroisopropyl)ether		NR							R			R			R		R
4-Methylphenol		NR							R			R			R		R
N-Nitroso-di-n-propylamine		NR					R	R	R		R	R		R	R		R
Hexachloroethane		NR							R			R			R		R
Nitrobenzene		NR							R			R			R		R
Isophorone		NR							R			R			R		R
2-Nitrophenol		NR							R			R			R		R
2,4-Dimethylphenol		NR							R			R			R		R
Benzoic acid		NR							R			R			R		R
bis(2-Chloroethoxy)methane		NR							R			R			R		R
2,4-Dichlorophenol		NR							R			R			R		R
1,2,4-Trichlorobenzene		NR							R			R			R		R
Naphthalene		NR							R		J	R			R		R
4-Chloroaniline		NR							R			R			R		R
Hexachlorobutadiene		NR							R			R			R		R
4-Chloro-3-Methylphenol		NR							R			R			R		R
2-Methylnaphthalene		NR							R		630 E	R			R		R
Hexachlorocyclopentadiene		NR							R			R			R		R
2,4,6-Trichlorophenol		NR							R			R			R		R
2,4,5-Trichlorophenol		NR							R			R			R		R
2-Chloronaphthalene		NR							R			R			R		R
2-Nitroaniline		NR							R			R			R		R
Dimethylphthalate		NR							R			R			R		R
Acenaphthylene		NR							R		J	R			R		R
2,6-Dinitrotoluene		NR							R			R			R		R
3-Nitroaniline		NR							R			R			R		R
Acenaphthene		NR							R			R			R		R
2,4-Dinitrophenol		NR							R			R			R		R
4-Nitrophenol		NR							R			R			R		R
Dibenzofuran		NR							R			R			R		R
2,4-Dinitrotoluene		NR							R			R			R		R
Diethylphthalate		NR							R			R			R		R
4-Chlorophenyl-phenyl ether		NR							R			R			R		R
Fluorene		NR							R		J	R			R		R
4-Nitroaniline		NR							R			R			R		R
4,6-Dinitro-2-methylphenol		NR							R			R			R		R
N-nitrosodiphenylamine		NR							R			R			R		R
4-Bromophenyl-phenyl ether		NR							R			R			R		R
Hexachlorobenzene		NR							R			R			R		R

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TABLE SITE INSPECTION SAMPLING RESULTS (cont'd)

SITE NAME: VI CHEMICAL
TDD#: 02-9101-04
SAMPLING DATE: 2/28/00
EPA CASE NO.: 15933 LAB: COMPUHEM

SEMI-VOLATILES

Sample ID No.	VI25-GW1(MS)	VI25-GW2	VI25-GW3(DUV)	VI25-GW4	VI25-GW5	VI25-GW6	VI25-SED1	VI25-SED2	VI25-SED3	VI25-SED4(DVI)	VI25-SED5	VI25-SED6	VI25-S1(MS)	VI25-S2	VI25-S3	VI25-S6	VI25-R1M1
Traffic Report No.	BGL01	BGL02	BGL03	BGL04	BGL05	BGL06	BGL09	BGL10	BGL11	BGL12	BGL17	BGL16	BGL13	BGL14	BGL15	BGL23	BGL18
Matrix	WATER	WATER	WATER	WATER	WATER	WATER	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SOIL	SOIL	SOIL	SOIL	WATER
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Dilution Factor/GPC Cleanup (Y)	1	1	1	1	1	1	1	1	1	1	1	4	1	1	1	1	1
Percent Moisture	--	--	--	--	--	--	27	33	43	34	19	42	16	16	18	9	--

Pentachlorophenol					NR				R		R	R	R		R	J	
Phenanthrene					NR				R		J	R			R	R	
Anthracene					NR				R		R	R			R	R	
Di-n-butylphthalate					NR				R		J	R			R	R	
Fluoranthene					NR	10 E			R		J	R			R	R	
Pyrene					NR				R		J	J			R	R	
Butylbenzylphthalate	J			J	NR				R		J	R			R	R	
3,3'-Dichlorobenzidine					NR				R		R	R			R	R	
Benzo(a)anthracene					NR				R		R	R			R	R	
Chrysene					NR				R		R	R			R	R	
bis(2-Ethylhexyl)phthalate		J			NR	J			R		2200 E	R			R	R	J
Di-n-octylphthalate					NR				R		R	R			R	R	
Benzo(b)fluoranthene					NR				R		R	R			R	R	
Benzo(k)fluoranthene					NR				R		R	R			R	R	
Benzo(a)pyrene					NR				R		R	R			R	R	
Indeno(1,2,3-cd)pyrene					NR				R		R	R			R	R	
Dibenz(a,h)anthracene					NR				R		R	R			R	R	
Benzo(g,h,i)perylene					NR				R		R	R			R	R	

NOTES:

Blank space - compound analyzed for but not detected

B - compound found in lab blank as well as sample, indicates possible/probable blank contamination

E - estimated value

J - estimated value, compound present below CRQL but aboveIDL

R - analysis did not pass EPA GAG

N - Presumptive evidence of the presence of the material

NR - analysis not required

Detection limits elevated if Dilution Factor >1 and/or percent moisture >0

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TABLE

SITE INSPECTION SAMPLING RESULTS
(cont'd)

SITE NAME: VI CHEMICAL
 ID#: 02-7101-04
 SAMPLING DATE: 2/28/91
 EPA CASE NO.: 15932 LAF: COMPUHER

SEMI-VOLATILES	
Sample ID No.	VICS-RIN2 VICS-TBLK1
Traffic Report No.	BGL20 BGL22
Matrix	WATER WATER
Units	ug/L ug/L
Dilution Factor/GPC Cleanup (Y)	1 N/A
Percent Moisture	-- N/A
Phenol	NR
bis(2-Chloroethyl)ether	NR
2-Chlorophenol	NR
1,3-Dichlorobenzene	NR
1,4-Dichlorobenzene	NR
Benzyl alcohol	NR
1,2-Dichlorobenzene	NR
2-Methylphenol	NR
bis(2-Chloroisopropyl)ether	NR
4-Methylphenol	NR
N-Nitroso-di-n-dipropylamine	NR
Hexachloroethane	NR
Nitrobenzene	NR
Isophorone	NR
2-Nitrophenol	NR
2,4-Dimethylphenol	NR
Benzoic acid	NR
bis(2-Chloroethoxy)methane	NR
2,4-Dichlorophenol	NR
1,2,4-Trichlorobenzene	NR
Naphthalene	NR
4-Chloroaniline	NR
Hexachlorobutadiene	NR
4-Chloro-3-Methylphenol	NR
2-Methylnaphthalene	NR
Hexachlorocyclopentadiene	NR
2,4,6-Trichlorophenol	NR
2,4,5-Trichlorophenol	NR
2-Chloronaphthalene	NR
2-Nitroaniline	NR
Dimethylnthalate	NR
Acenaphthylene	NR
2,6-Dinitrotoluene	NR
3-Nitroaniline	NR
Acenaphthene	NR
2,4-Dinitrophenol	NR
4-Nitrophenol	NR
Dibenzofuran	NR
2,4-Dinitrotoluene	NR
Diethylphthalate	NR
4-Chlorophenyl-phenyl ether	NR
Fluorene	NR
4-Nitroaniline	NR
4,6-Dinitro-2-methylphenol	NR
N-nitrosodiphenylamine	NR
4-Bromophenyl-phenyl ether	NR
Hexachlorobenzene	NR

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08/06/91

SITE NAME: VI CHEMICAL
 TDD#: 02-9101-04
 SAMPLING DATE: 2/29/91
 EPA CASE NO.: 15933 LAL: COMFUTEM

TABLE !
 SITE INSPECTION SAMPLING RESULTS
 (cont'd)

SEMI-VOLATILES	
Sample ID No.	VI25-RIN2 VI25-TBLK1
Traffic Report No.	BGL17 BGL22
Matrix	WATER WATER
Units	ug/L ug/L
Dilution Factor/GPC Cleanup FYI	1 N/A
Percent Moisture	-- N/A
Pentachlorophenol	NR
Phenanthrene	NR
Anthracene	NR
Di-n-butylphthalate	NR
Fluoranthene	NR
Pyrene	NR
Butylbenzylphthalate	NR
3,3'-Dichlorobenzidine	NR
Benzo(a)anthracene	NR
Chrysene	NR
bis(2-Ethylhexyl)phthalate	NR
Di-n-octylphthalate	NR
Benzo(b)fluoranthene	NR
Benzo(k)fluoranthene	NR
Benzo(a)pyrene	NR
Indeno(1,2,3-cd)pyrene	NR
Dibenz(a,h)anthracene	NR
Benzo(g,h,i)perylene	NR

NOTES:

Blank space - compound analyzed for but not detected
 B - compound found in lab blank as well as sample, indicates possible/possible blank contamination
 E - estimated value
 J - estimated value, compound present below CRQL but above IFL
 R - analysis did not pass EPA QA/QC
 N - Presumptive evidence of the presence of the material
 NR - analysis not required
 Detection limits elevated if Dilution Factor >1 and/or percent moisture >0

100295

SITE NAME: CHEMICAL
 TDD#: 02-9101-04
 SAMPLING DATE: 2/28/91
 EPA CASE NO.: 15933 LAB: COMPUchem

TABLE SITE INSPECTION SAMPLING RESULTS (cont'd)

PESTICIDES

Sample ID No.	V125-GW1-ME	V125-GW2	V125-GW3(DUV)	V125-GW4	V125-GW5	V125-GW6	V125-SED1	V125-SED2	V125-SED3	V125-SED4(DV)	V125-SED5	V125-SED6	V125-S1(MS/)	V125-S2	V125-S3	V125-S6	V125-R1W1
Traffic Report No.	BGL01	BGL02	BGL03	BGL04	BGL05	BGL06	BGL09	BGL10	BGL11	BGL12	BGL17	BGL16	BGL13	BGL14	BGL15	BGL23	BGL18
Matrix	WATER	WATER	WATER	WATER	WATER	WATER	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SOIL	SOIL	SOIL	SOIL	WATER
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Dilution Factor/GPC Cleanup (%)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Percent Moisture	--	--	--	--	--	--	27	33	43	34	19	42	16	16	18	9	--

alpha-BHC					NR												
beta-BHC					NR												
delta-BHC					NR								7.7 E				
gamma-BHC (Lindane)					NR						J						
Heptachlor				J	NR												
Aldrin					NR							12 E	20 E			30 E	
Heptachlor epoxide				J	NR						4.8 E			J		10 E	
Endosulfan I					NR						4 E						
Dieldrin					NR		J				4.1 E	10 E		J		J	
4,4'-DDE				J	NR							24 E				5.8 E	
Endrin					NR		J									J	
Endosulfan II				J	NR							9.5 E					
4,4'-DDD					NR												
Endosulfan sulfate				J	NR											J	
4,4'-DDT					NR		J				J					J	
Methoxychlor					NR						J		J				
Endrin ketone				J	NR											J	
alpha-Chlordane					NR						3.5 E			4 E			
gamma-Chlordane				J	NR						6.1 E	16 E	4.9 E	J		7.5 E	
Toxaphene					NR												
Aroclor-1016					NR												
Aroclor-1221					NR												
Aroclor-1232					NR												
Aroclor-1242					NR												
Aroclor-1248					NR												
Aroclor-1254					NR												
Aroclor-1260					NR												

NOTES:

Blank space - compound analyzed for but not detected
 B - compound found in lab blank as well as sample, indicates possible/probable blank contamination
 E - estimated value
 J - estimated value, compound present below CRQL but above IDL
 R - analysis did not pass EPA QA/QC
 N - Presumptive evidence of the presence of the material
 NR - analysis not required
 Detection limits elevated if Dilution Factor >1 and/or percent moisture >5

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SITE NAME: VI CHEMICAL
 TDD#: 02-9101-04
 SAMPLING DATE: 2/28/91
 EPA CASE NO.: 15933 LAB: COMPUCHEM

TABLE 1
 SITE INSPECTION SAMPLING RESULTS
 (cont'd)

PESTICIDES		
Sample ID No.	VI25-R1M2	VI25-T6LN1
Traffic Report No.	BGL19	BGL22
Matrix	WATER	WATER
Units	ug/L	ug/L
Dilution Factor/GPC Cleanup (Y)	1	N/A
Percent Moisture	--	N/A
alpha-BHC		NR
beta-BHC		NR
delta-BHC		NR
gamma-BHC (Lindane)		NR
Heptachlor		NR
Aldrin		NR
Heptachlor epoxide		NR
Endosulfan I		NR
Dieldrin		NR
4,4'-DDE		NR
Endrin		NR
Endosulfan II		NR
4,4'-DDD		NR
Endosulfan sulfate		NR
4,4'-DDT		NR
Methoxychlor		NR
Endrin ketone		NR
alpha-Chlordane		NR
gamma-Chlordane		NR
Toxaphene		NR
Aroclor-1016		NR
Aroclor-1221		NR
Aroclor-1232		NR
Aroclor-1242		NR
Aroclor-1248		NR
Aroclor-1254		NR
Aroclor-1260		NR

NOTES:

Blank space - compound analyzed for but not detected
 B - compound found in lab blank as well as sample, indicates possible/probable blank contamination
 E - estimated value
 J - estimated value, compound present below CRQL but above IDL
 R - analysis did not pass EPA QA/QC
 M - Presumptive evidence of the presence of the material
 NR - analysis not required
 Detection limits elevated if Dilution Factor >1 and/or percent moisture >0%

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02-9101-04-SI
 Rev. No. 0

SITE NAME: I CHEMICAL
 TDD#: 02-9101-04
 SAMPLING DATE: 2/28/91
 EPA CASE NO.: 15933
 LAB NAME: SKINNER

TABLE
 SITE INSPECTION SAMPLING RESULTS
 (cont'd)

INORGANICS

Sample ID No.
 Traffic Report No.
 Matrix
 Units
 Dilution Factor

	VI25-GW1(MS/MSD)	VI25-GW2	VI25-GW3(DUP)	VI25-GW4	VI25-GW5	VI25-GW6	VI25-SED1	VI25-SED2	VI25-SED3	VI25-SED4(DUP)	VI25-SED5	VI25-SED6	VI25-S1(MS/MSD)	VI25-S2	VI25-S3
	MBFA01	MBFA02	MBFA03	MBFA04	MBFA05	MBFA06	MBFA09	MBFA10	MBFA11	MBFA12	MBFA17	MBFA18	MBFA13	MBFA14	MBFA15
	WATER	WATER	WATER	WATER	WATER	WATER	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SOIL	SOIL	SOIL
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aluminum	J	J	J	J		J	15700	32400	30400	33600	9400	10600	13800	21700	21000
Antimony							J	J	J		28.6 E	J			J
Arsenic	J				J		J	3.2 E	4.1 E	3.8 E	8 E	5.5 E	J	7.8 E	9.1 E
Barium	J	J	J	J	J	J	90.3	115	111	122	48.8	95.8	108	135	198
Beryllium									J						
Cadmium												4.5			
Calcium	68800	69900	74100	127000	81300	75800	45800	74900	79900	82100	51200	42100	89300	23300	43100
Chromium							18.7 E	18.3 E	17.8 E	16.8 E	57.8 E	110 E	19.8 E	27.9 E	49 E
Cobalt							14.7	23.7	24.8	25.4	13.8	17.3	13.4	21.1	22.3
Copper	J	J	J	J	J	J	48.4	80.5	82	64.8	367	109	58.7	99.8	73.7
Iron	121 E	J	J	J	J	J	25700	35800	39200	38400	183000	121000	21500	44100	81700
Lead	3.1	4	4.2	3.9	3.7	5.9	15.1	7.5	7.5	7.8	488	187	9	35.3	322
Magnesium	43500	48600	50500	71800	40100	58000	7880	10900	11800	11800	4740	5000	7830	7800	7420
Manganese	J	383	400	17.7			954	1320	1400	1430	925	1420	735	1050	987
Mercury	2 E		3.3 E		1.2 E	0.72 E									
Nickel							10.8 E	13.8 E	14.8 E	15.2 E	47.8 E	49.8 E	10.7 E	18.8 E	33.5 E
Potassium	J	J	J	J	J	J	J	1490	J	1600	J	J	2170	2890	2920
Selenium	J														
Silver															
Sodium	548000 E	363000 E	374000 E	590000 E	572000 E	237000 E	J	1840 E	J	1750 E	J	J	J	J	J
Thallium															
Vanadium	J	J	J	J	50.3 E	J	82.4	82.1	83.2	84.8	J	J	74.7	97.2	83.5
Zinc	J	J	21.8	J	J	38.9	53.9 E	73.5 E	82.3 E	79.9 E	1500 E	1710 E	142 E	387 E	382 E

NOTES:

Blank space - compound analyzed for but not detected

E - estimated value

J - estimated value, compound present below CRDL but above IDL

R - analysis did not pass EPA QA/QC

NR - analysis not required

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08/28/91

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 Rev. No. 0

TABLE 1
SITE INSPECTION SAMPLING RESULTS
(cont'd)

SITE NAME: VI CHEMICAL
TDD#: 02-9101-04
SAMPLING DATE: 2/28/91
EPA CASE NO.: 15933
LAB NAME: SKINNER

INORGANICS				
Sample ID No.	VI25-S6	VI25-RIN1	VI25-RIN2	VI25-TBLK1
Traffic Report No.	MBFA22	MBFA18	MBFA19	N/A
Matrix	SOIL	WATER	WATER	N/A
Units	mg/kg	ug/L	ug/L	ug/L
Dilution Factor				
Aluminum	19200	J	J	NR
Antimony				NR
Arsenic	J			NR
Barium	119			NR
Beryllium				NR
Cadmium				NR
Calcium	18000	J	J	NR
Chromium	20 E			NR
Cobalt	19.5			NR
Copper	43.7		J	NR
Iron	25300	223 E	J	NR
Lead	9.9	3.6	J	NR
Magnesium	5160	J	J	NR
Manganese	1070	J		NR
Mercury			0.26 E	NR
Nickel	10.3 E			NR
Potassium	2500	J	J	NR
Selenium				NR
Silver				NR
Sodium	J	J	J	NR
Thallium				NR
Vanadium	84.9			NR
Zinc	44.3 E		J	NR

NOTES:

Blank space - compound analyzed for but
not detected

E - estimated value

J - estimated value, compound present
below CRDL but aboveIDL

R - analysis did not pass EPA QA/QC

NR - analysis not required

100299

02-9101-04-SI
Rev. No. 0

PART IV: HAZARD ASSESSMENT

GROUNDWATER ROUTE

1. Describe the likelihood of a release of contaminant(s) to the groundwater as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.

There is an observed release to groundwater from the facility. Chloroform was detected in samples collected by Halliburton NUS Environmental Corporation from an on site production well (31 ug/L) and from two downgradient public supply wells (12 ug/L). Chloroform was also detected in an upgradient well, but at a concentration below contract required quantitation limits (CRQL). During the U.S. EPA Response and Prevention Branch Removal Site Evaluation Inspection, a 55-gallon drum of chloroform in poor condition was found on site along with 4 liters of chloroform in laboratory reagent containers.

Ref. Nos. 1, 16

2. Describe the aquifer of concern; include information such as depth, thickness, geologic composition, areas of karst terrain, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.

The aquifer of concern is the alluvial deposits which mantle much of the area around the site. The alluvium is composed mostly of clay, which has a very low permeability. Interbedded with the clay are thin lenses of sand and gravel ranging in thickness from 2 to 4 feet. The interconnection between these lenses is unknown but the lenses are believed to be isolated and limited. Most groundwater in the alluvium appears to be under partially confined conditions and the thickness of these deposits can reach 100 feet. The alluvium is underlain by limestones, chalks, and marls of the Kingshill Limestone. On-site borings indicate that the upper surface soils consist of stiff silty clay or silty sand with variable amounts of clay to a depth of 2.5 feet. Underlying these surface soils is a medium dense to dense silty sand and gravel or sandy silt layer which merges with sandy silt or silty sand with numerous rock fragments and various sandy clay seams. The lowest soil formation encountered was a medium dense to very dense silty sand which extends to a depth of more than 25 feet. These borings indicated that the hydrostatic water table is approximately 20 feet below the present ground surface; however, this level will fluctuate throughout the year. Groundwater in the area of the site is reported to flow to the southeast.

Ref. Nos. 2, 6, 7

3. Is a designated well head protection area within 4 miles of the site?

Well head protection area information is unavailable for the U.S. Virgin Islands.

4. What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?

Analytical data from groundwater samples collected during the Halliburton NUS Environmental Corporation sampling inspection indicate that contaminants from the site have migrated to groundwater in the area of the site. Therefore, contaminants from the site are in contact with the aquifer of concern.

Ref. Nos. 1, 16

5. What is the permeability value of the least permeable continuous intervening stratum between the ground surface and the aquifer of concern?

Silty clay is reported to have a permeability value of approximately 10^{-5} to 10^{-7} cm/sec.

Ref. No. 8

6. What is the distance to and depth of the nearest well that is currently used for drinking purposes?

The Fairplains No. 9 public supply well is located approximately 500 to 600 feet south of the site. This well is reported to be between 90 to 100 feet deep.

Ref. Nos. 9, 10

7. If a release to groundwater is observed or suspected, determine the number of people that obtain drinking water from wells that are documented or suspected to be located within the contamination boundary of the release.

A release to groundwater from the facility is observed. Chloroform was detected in samples collected from two public supply wells located less than 0.25 mile southeast of the site. It has been determined that approximately 2,550 people are supplied by these two wells.

Ref. Nos. 16, 22

8. Identify the population served by wells located within 4 miles of the site that draw from the aquifer of concern.

<u>Distance</u>	<u>Population</u>
0 - $\frac{1}{4}$ mi	2,550
$>\frac{1}{4}$ - $\frac{1}{2}$ mi	8,910
$>\frac{1}{2}$ - 1 mi	12,730
>1 - 2 mi	3,820
>2 - 3 mi	5,090
>3 - 4 mi	3,820

There are 31 public supply wells within four miles of the site. The water from these wells, with the exception of two, is all blended into one system which supplies the entire western end of the island of St. Croix. The total population supplied by groundwater is approximately 37,000 people. The two wells not connected to the system supply only the airport and are assumed to supply approximately 100 people; therefore, the total number of people supplied by the blended well system is approximately 36,900. Since all wells are part of a blended system it can be assumed, for purposes of this report, that each well supplies an equal number of people. This number was determined by dividing the total population supplied by groundwater by the number of wells located within 4 miles of the site, thus indicating the number of people supplied by each well within 4 miles of the site. The population supplied by one well was then multiplied by the number of wells per distance ring to determine the total population supplied by wells located within each distance ring (See Ref. No. 22 for calculations).

Ref. No. 22

9. Identify uses of groundwater within 4 miles of the site (i.e. private drinking source, municipal source, commercial, irrigation, unuseable).

Public and private drinking wells are located within 4 miles of the site. Groundwater in the area is used as a municipal and private drinking source, for irrigation, and for commercial purposes.

Ref. Nos. 7, 10, 19, 20

SURFACE WATER ROUTE

10. Describe the likelihood of a release of contaminant(s) to surface water as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.

There is a suspected release to surface water from the facility. Sediment samples collected by Halliburton NUS Environmental Corporation from two on-site storm drains indicate the presence of 2-butanone (150 ug/kg), total xylenes (estimated 86 ug/kg), bis (2-ethylhexyl) phthalate (estimated 2,200 ug/kg), 2-methylnaphthalene (estimated 630 ug/kg), chromium (estimated 110 ug/kg), copper (367 ug/kg), lead (466 ug/kg), zinc (estimated 1,710 ug/kg), and estimated concentrations of various pesticides. These on-site storm drains discharge to an intermittent stream, River Gut, which leads to the Caribbean Sea. Lead concentrations found in the downstream sediment sample (15.1mg/kg) are higher than those found in the upstream sediment samples (7.5 mg/kg)

Ref. Nos. 2, 16

11. Identify the nearest downslope surface water. If possible, include a description of possible surface drainage patterns from the site.

Fair Plain Gut, an intermittent drainage way that retains water due to natural damming from beach sediments, is the nearest downslope surface water. Drainage from the site is along an intermittent stream, River Gut, which is adjacent to the north and east borders of the site. River Gut will flow directly into Fair Plain Gut, which empties directly into the Caribbean Sea.

Ref. Nos. 13, 14, 21

12. What is the distance to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.

The distance from the site, along River Gut, to Fair Plain Gut is approximately 0.5 mile.

Ref. No. 21

13. Determine the type of floodplain that the site is located within.

There is no known floodplain information for the U.S. Virgin Islands.

14. Identify drinking water intakes in surface waters within 15 miles downstream of the site. For each intake identify: the distance from the point of surface water entry, population served, and stream flow at the intake location.

<u>Intake</u>	<u>Distance</u>	<u>Population Served</u>	<u>Flow (cfs)</u>

There are no known drinking water intakes located in surface waters within 15 miles downstream of the site.

Ref. Nos. 7, 25

15. Identify fisheries that exist within 15 miles downstream of the point of surface water entry. For each fishery specify the following information:

<u>Fishery Name</u>	<u>Water Body Type</u>	<u>Flow (cfs)</u>	<u>Saline/Fresh/Brackish</u>
Fair Plain Gut	Coastal Tidal Water	N/A	Saline/Brackish
Caribbean Sea	Ocean	N/A	Saline

The 15-mile surface water pathway covers approximately the entire southern coast of the island, with the exception of the eastern tip. There are numerous bays located along the southern coast, all of which may be considered fisheries; however, to avoid confusion, all waters along the southern coast of St. Croix will be referred to as the Caribbean Sea and considered as one fishery.

Ref. Nos. 13, 14

100302

16. Identify sensitive environments that exist within 15 miles of the point of surface water entry. For each sensitive environment specify the following:

<u>Sensitive Environment</u>	<u>Water Body Type</u>	<u>Flow (cfs)</u>	<u>Wetland Frontage (miles)</u>
Manning Bay Wetland	Coastal Tidal Water	N/A	3
Various Coral Reefs	Ocean	N/A	N/A

The 15-mile surface water pathway covers approximately the entire southern coast of the island, with the exception of the eastern tip. There are numerous tracks of coastal land designated as being used for preservation, conservation, recreation, traditional uses, and protection along this 15-mile pathway. However, only sensitive environments that are contiguous with water bodies having a flow rate of 100 cubic feet per second (cfs) or less will be evaluated in this report.

Ref. Nos. 13, 14, 15

17. If a release to surface water is observed or suspected, identify any intakes, fisheries, and sensitive environments from question Nos. 14-16 that are or may be located within the contamination boundary of the release.

Intake: None

Fishery: None

Sensitive Environment: None

There is a suspected release to surface water; however, there are no known analytical data to document that a fishery or sensitive environment is located within the contamination boundary of the suspected release.

Ref. No. 16

SOIL EXPOSURE PATHWAY

18. Determine the number of people that occupy residences or attend school or day care on or within 200 feet of the site property.

There are no residences, schools, or day care facilities located within 200 feet of the site property.

Ref. No. 9

19. Determine the number of people that work on or within 200 feet of the site property.

During the Halliburton NUS Environmental Corporation Region 2 FIT sampling inspection, approximately 10 workers were observed on site. Another facility is located within 200 feet to the east of the site. The exact number of workers is unknown but is assumed to be 25 due to the size of the facility.

Ref. Nos. 9, 12

20. Identify terrestrial sensitive environments on or within 200 feet of the site property.

There is no known terrestrial sensitive environment located within 200 feet of the site property.

Ref. Nos. 9, 12, 13

AIR ROUTE

21. Describe the likelihood of release of contaminants to air as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release define the supporting analytical evidence.

A release of contaminants from the facility to air is not suspected. All wastes on site were reported to have been stored in either the lab/warehouse building or in the aboveground tanks on site. There are no known reports of a release to air. During the Halliburton NUS Environmental Corporation Region 2 FIT sampling inspection conducted on February 28, 1991, no readings above background were detected on the OVA or HNu in the ambient air. There is adequate vegetation to prevent the airborne release of contaminated particulates during dry and dusty periods.

Ref. Nos. 2 through 5, 9

22. Determine populations that reside within 4 miles of the site.

<u>Distance</u>	<u>Population*</u>
0 - $\frac{1}{4}$ mi	160
$>\frac{1}{4}$ - $\frac{1}{2}$ mi	250
$>\frac{1}{2}$ - 1 mi	1,530
>1 - 2 mi	4,220
>2 - 3 mi	7,670
>3 - 4 mi	7,550

*Estimated

Ref. No. 17

23. Identify sensitive environments and wetlands acreage within $\frac{1}{2}$ mile of the site.

<u>0 - $\frac{1}{4}$ mile</u>	<u>$\frac{1}{4}$ - $\frac{1}{2}$ mile</u>
<u>Sensitive Environments/Wetland Acreage</u>	<u>Sensitive Environments/Wetland Acreage</u>

There is no known wetland or sensitive environment located within 0.5 mile of the site.

Ref. Nos. 13, 21

24. If a release to air is observed or suspected, determine the number of people that reside or are suspected to reside within the area of air contamination from the release.

A release of contaminants from the facility to air is not suspected. There are no known reports of a release to air. During the Halliburton NUS Environmental Corporation Region 2 FIT sampling inspection conducted on February 28, 1991, no readings above background were detected in the ambient air on the OVA or HNu.

Ref. No. 9

25. If a release to air is observed or suspected, identify any sensitive environments, listed in question No. 23, that are or may be located within the area of air contamination from the release.

A release of contaminants from the facility to air is not suspected. There are no known reports of a release to air. During the Halliburton NUS Environmental Corporation Region 2 FIT sampling inspection conducted on February 28, 1991, no readings above background were detected in the ambient air on the OVA or HNu.

Ref. No. 9

ATTACHMENT 1

100305

VI CHEMICAL
ST. CROIX, U.S. VI

CONTENTS

Exhibit A: Photograph Log (1/25/91)
Exhibit B: Photograph Log (2/28/91)

EXHIBIT A
PHOTOGRAPH LOG

VI CHEMICAL
ST. CROIX, U.S. VI

OFF-SITE RECONNAISSANCE: JANUARY 25, 1991

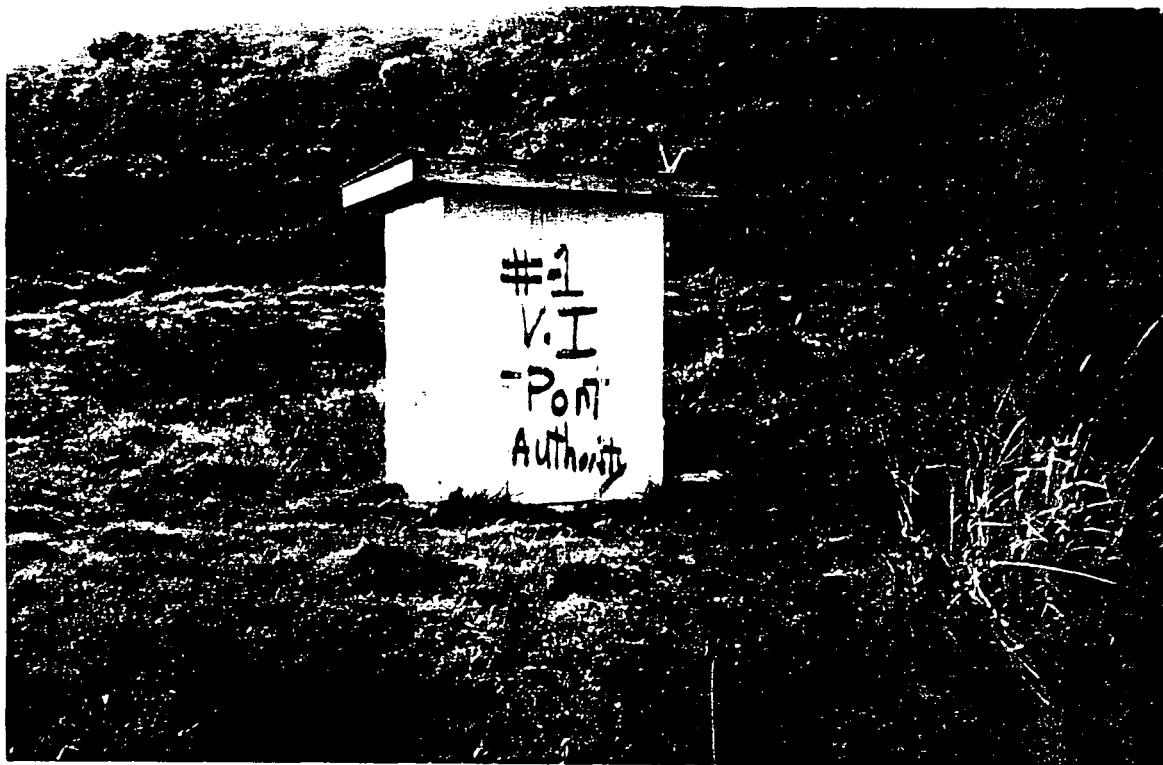
VI CHEMICAL
ST. CROIX, U.S. VI
JANUARY 25, 1991

PHOTOGRAPH INDEX

ALL PHOTOGRAPHS WERE TAKEN BY DAVID GRUPP

<u>Photo Number</u>	<u>Description</u>	<u>Time</u>
7P-16	Looking south at VIPA well number 1.	0852
7P-17	Looking south at VIPA well number 2.	0853
7P-18	Looking northwest at VIPA well numbers 1 and 2.	0855
7P-19	Looking north from entrance road at west side of site.	0907
7P-20,21	Looking northeast and east at the site from the entrance road.	0918
7P-22	Looking north at site entrance.	0922
7P-23	Looking east at USGS observation wells on west side of River Gut.	0939
8P-1	Looking at USGS observation wells on east side of Bethlehem Gut.	0944
8P-2	Looking east at well Fairplains No. 6.	1026
8P-3	Looking south at well Fairplains No. 8.	1033

VI CHEMICAL, ST. CROIX, U.S. VI



7P-16

January 25, 1991

0852

Looking at south at VIPA well number 1.



7P-17

January 25, 1991

0853

Looking south at VIPA well number 2.

100309

VI CHEMICAL. ST. CROIX. U.S. VI

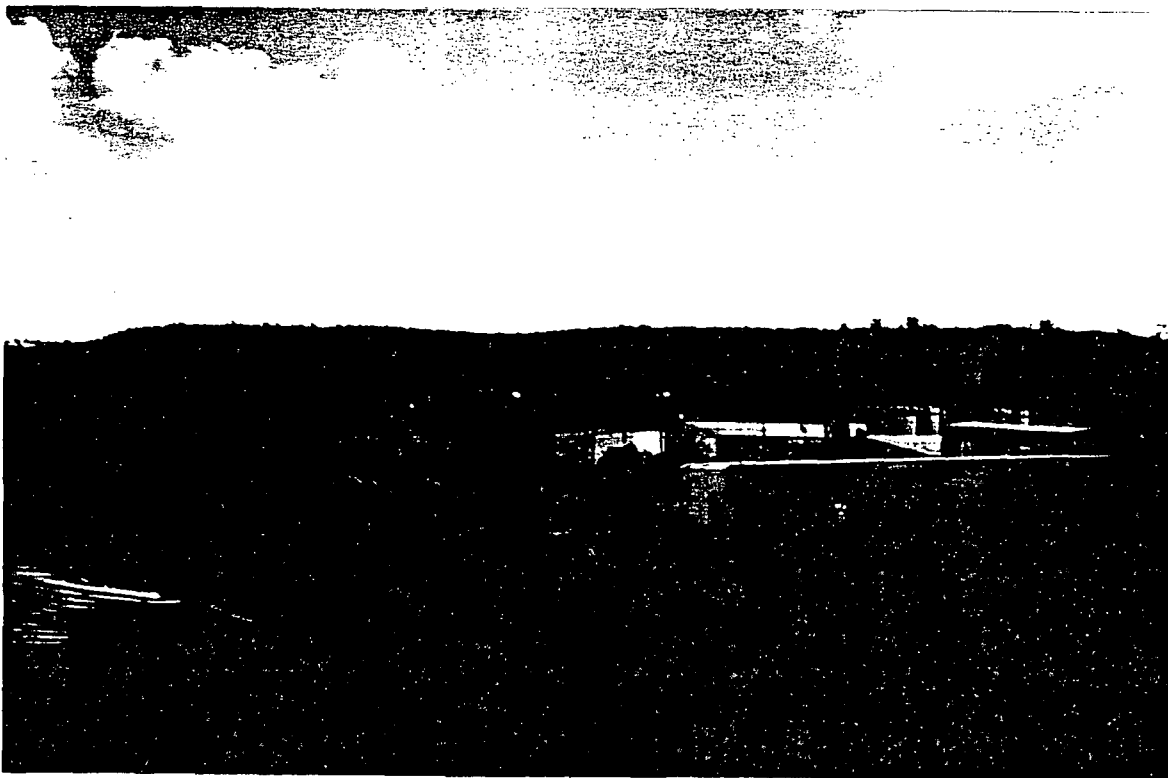


7P-18

January 25, 1991

0855

Looking northwest at VIPA well numbers 1 and 2.



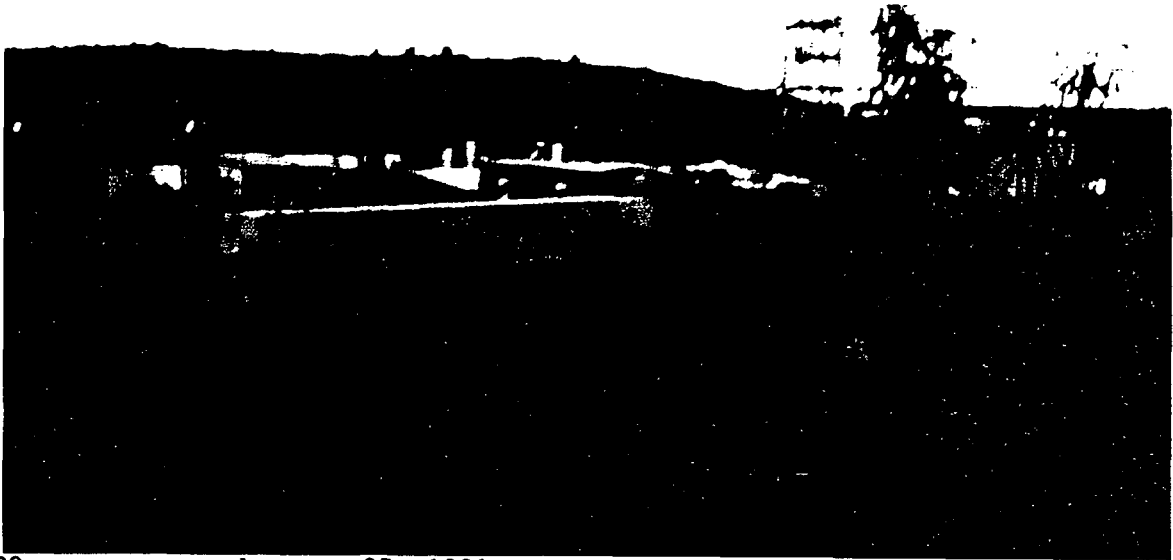
7P-19

January 25, 1991

0907

Looking north from entrance road at west side of site.

VI CHEMICAL. ST. CROIX. U.S. VI



7P-20

January 25, 1991

0918

Looking northeast and east at the site from the
entrance road.



7P-21

January 25, 1991

0918

Looking northeast and east at the site from the
entrance road.

100311

VI CHEMICAL ST. CROIX, II S. VT



7P-22

January 25, 1991
Looking north at site entrance.

0922



7P-23

January 25, 1991
Looking east at USGS observation wells on west side
of River Gut.

0939

VI CHEMICAL, ST. CROIX, U.S. VI

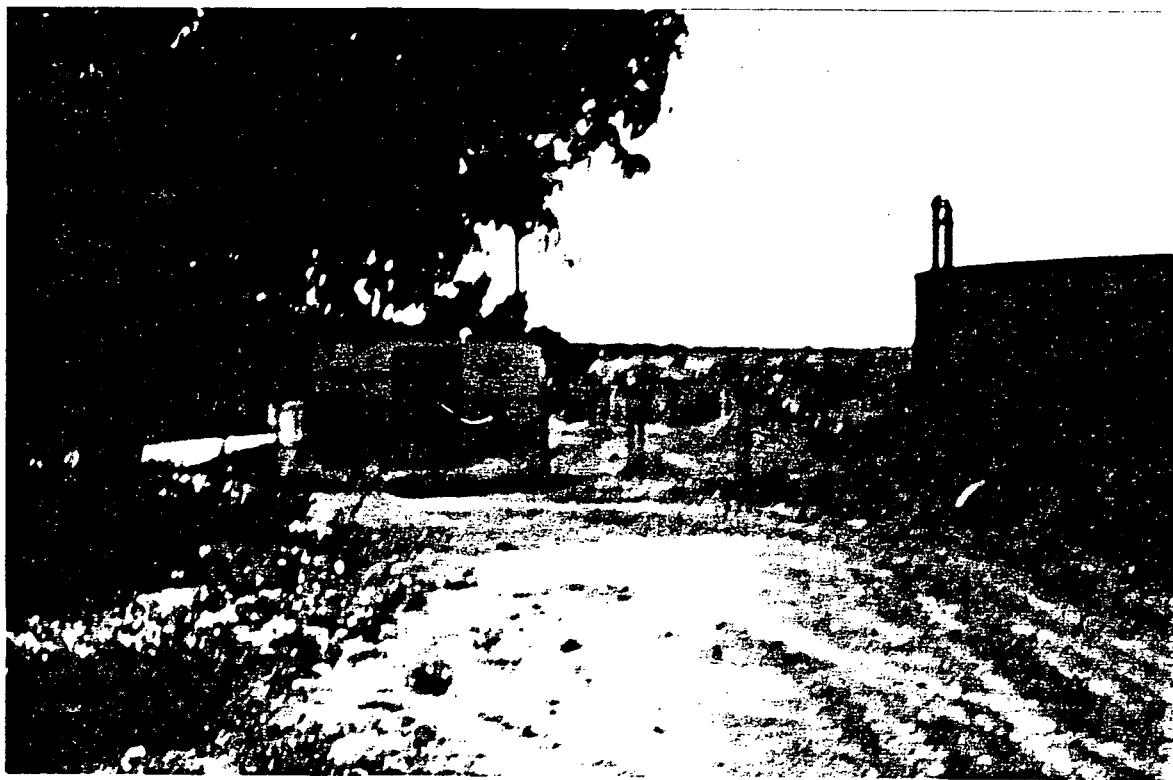


8P-1

January 25, 1991

0944

Looking at USGS observation wells on east side
of Bethlehem Gut.



8P-2

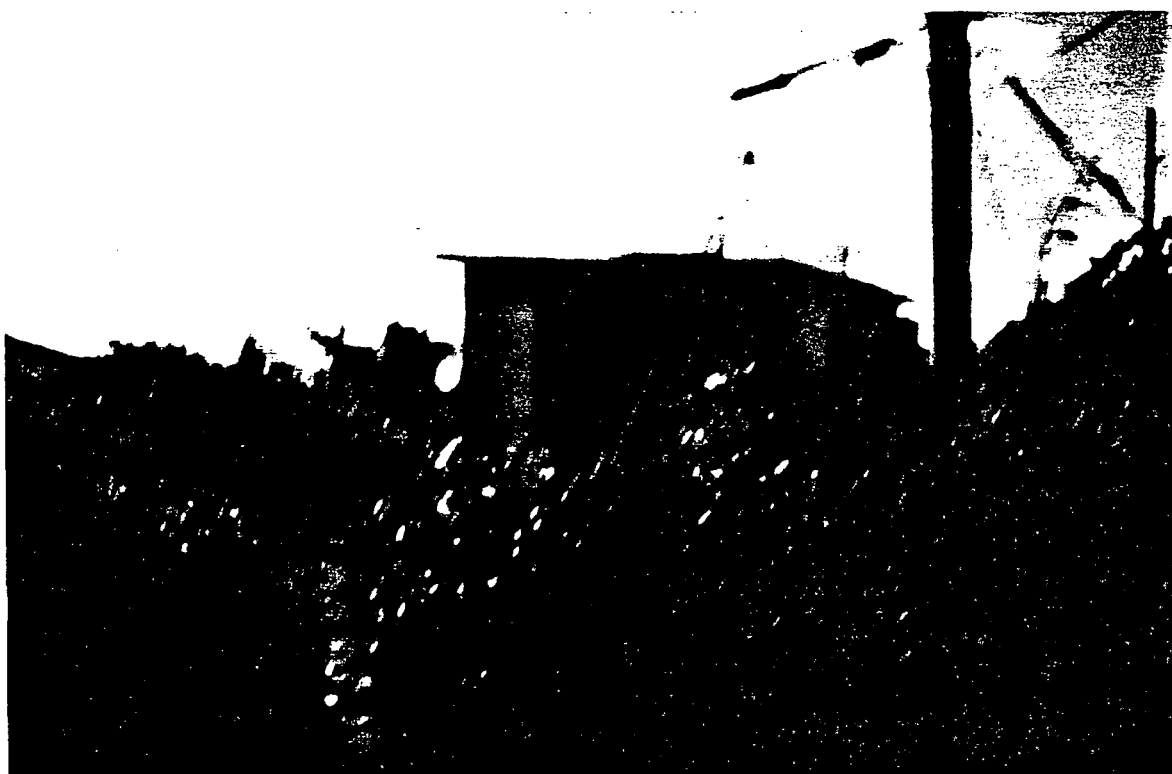
January 25, 1991

1026

Looking east at well Fairplains No. 6.

100313

VI CHEMICAL, ST. CROIX, U.S. VI



8P-3

January 25, 1991
Looking south at well Fairplains No. 8.

1033

100314

EXHIBIT B
PHOTOGRAPH LOG
VI CHEMICAL
ST. CROIX, U.S. VI

SITE INSPECTION: FEBRUARY 28, 1991

VI CHEMICAL
ST. CROIX, U.S. VI
FEBRUARY 28, 1991

PHOTOGRAPH INDEX

ALL PHOTOGRAPHS WERE TAKEN BY RICHARD SETTINO

<u>Photo Number</u>	<u>Description</u>	<u>Time</u>
1P-3	D. Foerter collecting GW-1.	1027
1P-4	G. Hannay collecting surface soil S-1.	1046
1P-5	D. Foerter collecting surface soil S-2.	1100
1P-6	D. Foerter collecting surface soil S-3.	1110
1P-7	G. Hannay collecting SED-6.	1148
1P-8	Storm drain along southern side of maintenance.	1151
1P-9	D. Foerter collecting SED-5.	1205
1P-10	G. Hannay collecting SED-1.	1238
1P-11	D. Foerter collecting duplicate sample SED-2, SED-4.	1255
1P-13	D. Foerter collecting SED-3.	1347
1P-14	G. Hannay and D. Grupp collecting duplicate sample GW-2, GW-3.	1414
1P-15	D. Grupp collecting GW-4.	1430
1P-17	D. Grupp collecting GW-5.	1456
1P-18	G. Hannay collecting GW-6.	1506
1P-19	G. Hannay collecting background soil sample S-6.	1516

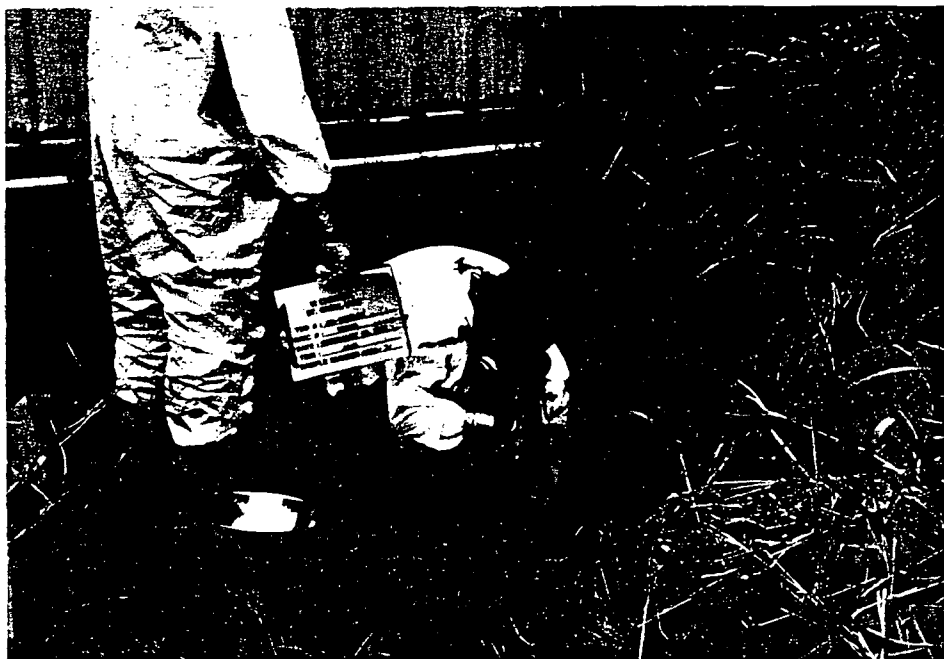
VI CHEMICAL, ST. CROIX, U.S. VI



1P-3

February 28, 1991
D. Foerter collecting GW-1.

1027



1P-4

February 28, 1991
G. Hannay collecting surface soil S-1.

1046

VI CHEMICAL, ST. CROIX, U.S. VI



1P-5

February 28, 1991
D. Foerter collecting surface soil S-2.

1100



1P-6

February 28, 1991
D. Foerter collecting surface soil S-3.

1110

100318

VI CHEMICAL, ST. CROIX, U.S. VI



1P-7

February 28, 1991
G. Hannay collecting SED-6.

1148



1P-9

February 28, 1991
D. Foerter collecting SED-5.

1205

100319

VI CHEMICAL, ST. CROIX, U.S. VI



1P-8

February 28, 1991
Storm drain along southern side of maintenance
building showing stressed vegetation.

1151

100320

VI CHEMICAL, ST. CROIX, U.S. VI



1P-10

February 28, 1991
G. Hannay collecting SED-1.

1238



1P-11

February 28, 1991
D. Foerter collecting duplicate sample SED-2, SED-4.

1255

VI CHEMICAL, ST. CROIX, U.S. VI



1P-13

February 28, 1991
D. Foerter collecting SED-3.

1347



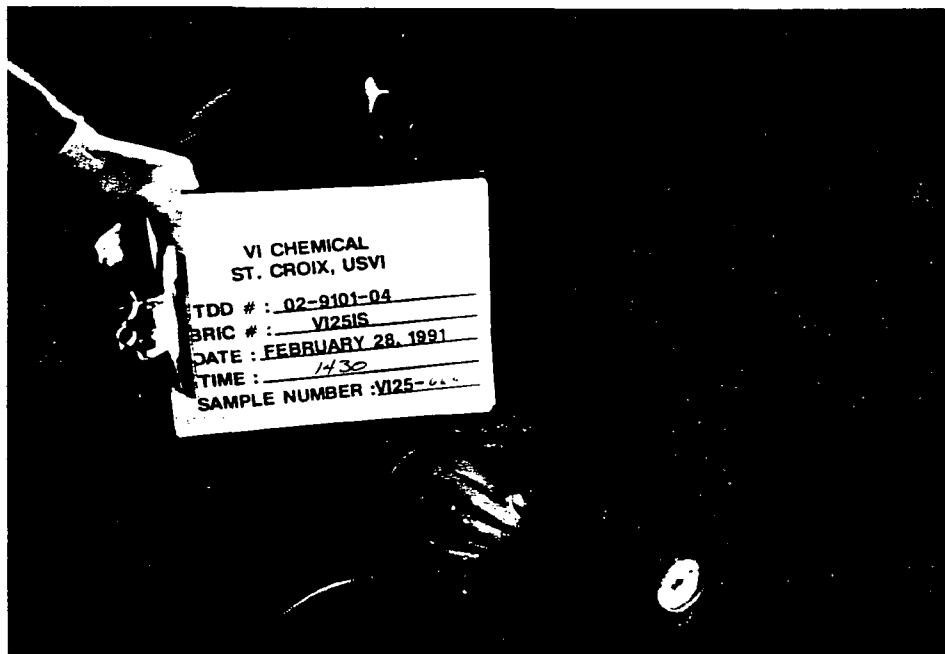
1P-14

February 28, 1991
G. Hannay and D. Grupp collecting duplicate sample
GW-2, GW-3.

1414

100322

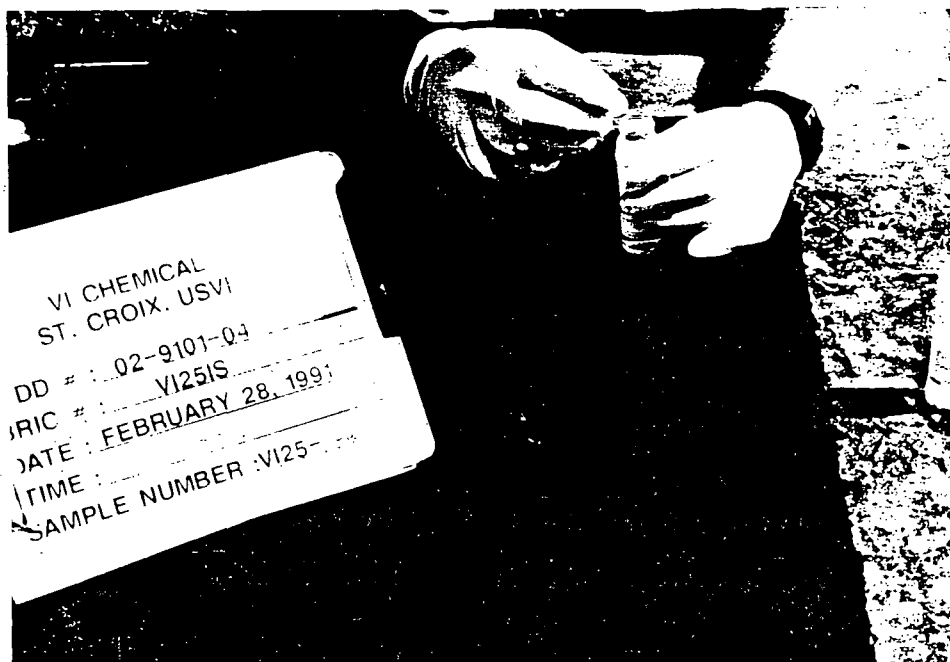
VI CHEMICAL, ST. CROIX, U.S. VI



1P-15

February 28, 1991
D. Grupp collecting GW-4.

1430



1P-17

February 28, 1991
D. Grupp collecting GW-5.

1456

100323

VI CHEMICAL, ST. CROIX, U.S. VI



1P-18

February 28, 1991
G. Hannay collecting GW-6.

1506



1P-19

February 28, 1991
G. Hannay collecting background soil sample S-6.

1516

ATTACHMENT 2

100325

REFERENCES

1. U.S. EPA Action Memorandum from Douglas R. Kodama, On-Scene Coordinator, Response and Prevention Branch to William J. Muszynski, P.E., Acting Regional Administrator thru Stephen D. Luftig, Director, Emergency and Remedial Response Division (all of U.S. EPA), Subject: Preliminary Assessment, Removal Site Evaluation, and Funding Authorization Request for a CERCLA Removal Action at the Virgin Island Chemical Company, Inc. Site, St. Croix, U.S. Virgin Islands. August 8, 1989.
2. Site Description for Island Chemical Company, St. Croix, U.S. Virgin Islands. Enviro-Science, Inc., April 16, 1987.
3. RCRA Enforcement Report for Berlex Laboratories (subsidiary of Island Chemical Co., Inc.) St Croix, Virgin Islands, prepared by Louis DiGuardia, Geologist, U.S. EPA Source Monitoring Section, September 9, 1985.
4. RCRA Enforcement Interim Report for Berlex Laboratories, St. Croix, VI, prepared by Carol Price, Environmental Scientist, U.S. EPA Source Monitoring Section, March 13, 1986.
5. Potential Hazardous Waste Site Preliminary Assessment for VI Chemical (Island Chemical) Site, Doug Kodama, U.S. EPA R&P Branch, February 10, 1989.
6. Geraghty & Miller, Inc. Report on Current Groundwater Conditions in the U.S. Virgin Islands, April 1983.
7. Telecon Note: Conversation between Alan Hatkin, U.S. G.S. VI Office, and Richard Settino, NUS Corp., January 30, 1991. Re: Groundwater information.
8. Permeability of Geologic Materials table derived from: Davis, S.N. Porosity and Permeability of Natural Materials in Flow-Through Porous Media, R.J.M. DeWest ed., New York, Academic Press, 1969 and Freeze R.A. and J.A. Cherry. Groundwater. New York, Prentice-Hall, Inc. 1979.
9. Field Notebook No. 0725, VI Chemical, TDD No. 02-9101-04, Off-site Reconnaissance and Sampling Inspection, NUS Corp. Region 2 FIT, Edison, New Jersey, January 15, 1991 and February 28, 1991.
10. Telecon Note: Conversation between Andres Morales, VI Water and Power Authority (WAPA), and Richard Settino, NUS Corp., February 15, 1991. Re: Public supply wells.
11. Telecon Note: Conversation between David Weston, VIAG Fuels, Inc., and Richard Settino, NUS Corp., February 13, 1991. Re: Site access.
12. Aerial Photograph for VI Chemical Site, Carribean Aerial Surveys, San Juan, Puerto Rico, Scale: 1 inch = 400 feet, October 9, 1989.
13. Letter from William Tobias, Fisheries Biologist, VI Department of Planning and Natural Resources, to Richard Settino, NUS Corp. February 14, 1991. Re: Sensitive environment information.
14. Fifteen-Mile Surface Water Pathway Map for the VI Chemical Site based on the U.S. Department of the Interior, Geological Survey Topographical Maps, 7.5 minute series, "Christiansted, VI" Quadrangle, 1958, revised 1982; "Frederiksted, VI" Quadrangle, 1958, revised 1982; and "East Point, VI" Quadrangle, 1958, revised 1982.

REFERENCES (CONT'D)

15. Coastal Zone Management Program Map for St. Croix, U.S. Virgin Islands, U.S. Virgin Islands Dept. of Planning and Natural Resources, undated.
16. U.S. EPA Contract Laboratory Program, Compuchem Laboratories (organic analyses) and Skinner & Sherman, Inc. (inorganic analyses), Case No. 15933, Laboratory Analyses from Halliburton NUS Environmental Corporation Region 2 FIT Site Inspection conducted on February 28, 1991.
17. Project Note: From R. Settino to VI Chemical File, Subject: Population Estimates for 4-mile Radius of VI Chemical Site, May 23, 1991.
18. U.S. EPA Superfund Program, Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site/Event Listing, pp. 441, 443, May 1, 1991, and Site Alias Location Listing, pp. 528, 531, April 1, 1991.
19. Telecon Note: Conversation between Mr. Hanley, VI Port Authority (VIPA), and Richard Settino, NUS Corp., February 1, 1991. Re: Well Information.
20. Telecon Note: Conversation between Elton Chongasing, VI WAPA, and Richard Settino, NUS Corp., February 7, 1991. Re: Public supply water information.
21. Four-Mile Vicinity Map for the VI Chemical Site based on the U.S. Department of the Interior, Geological Survey Topographical Maps, 7.5 minute series, "Christiansted, VI" Quadrangle, 1958, revised 1982; and "Frederiksted, VI" Quadrangle, 1958, revised 1982.
22. Project Note: From R. Settino to VI Chemical File, Subject: Estimated Population Supplied by Groundwater, May 28, 1991.
23. U.S. EPA Memorandum from John Higgins, P.E., On-Scene Coordinator, Response and Prevention Branch, to Sherrel Henry, Remedial Project Manager, Eastern New York /Caribbean Remedial Action Branch (both of U.S. EPA), Subject: Virgin Island Chemical Co. (VI Chem) Well Water Data. October 18, 1990.
24. Telecon Note: Conversation between VI Water and Power Authority, St. Croix, and Richard Settino, NUS Corp., July 10, 1991. Re: Surface water intake locations.

REFERENCE NO. 1

100328

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

AUG 8 1989

REGION II

DATE: Preliminary Assessment, Removal Site Evaluation, and Funding
Authorization Request for a CERCLA Removal Action at the Virgin
Island Chemical Company, Inc. Site, St. Croix, U.S. Virgin
Islands - ACTION MEMORANDUM

FROM: Douglas R. Kodama, On-Scene Coordinator *Douglas R. Kodama*
Response and Prevention Branch

TO: William J. Muszynski, P.E.
Acting Regional Administrator

THRU: *John S. Fusco* Stephen D. Luftig, Director
Emergency and Remedial Response Division

I. EXECUTIVE SUMMARY

On January 23, 1989, Mr. George Pavlou, Associate Director for Enforcement Programs, formally requested that the Response and Prevention Branch conduct a removal evaluation at the Virgin Island Chemical Company site in St. Croix, U.S. Virgin Islands. A preliminary assessment, site inspection and removal site evaluation were conducted on January 31 and February 1, 1989. —

Unstable and reactive hazardous materials are present in a building and on the grounds at this inactive chemical plant. Unknown contaminants are migrating off-site into the adjacent soil and potentially the ground water. Hazardous substances present include chlorine and hydrogen chloride, both of which are contained in extremely deteriorated cylinders, sodium metal a water-reactive material posing a threat of fire and potassium cyanide. Other reactive materials include diisobutyl aluminum hydride (a pyrophoric liquid), phosphorus pentoxide, sodium borohydride, sodium hydride and ethyl ether (potentially shock-sensitive).

Five businesses are adjacent to the facility and the St. Croix Prison at Golden Grove is located approximately one-quarter mile downwind from the site. An air release or fire at this chemical plant could adversely affect the prison, businesses and area residents.

The proposed removal action will address all above ground containerized materials and is expected to take eight to ten months to complete. The estimated project ceiling is \$1,840,000 of which \$1,262,000 is for mitigation contracting.

II. BACKGROUND

A. Site Setting/Description

The Virgin Island Chemical Company (VIChem) is located on Plot 13Q of Estate Bethlehem Middle Works off of the Melvin Evans Highway (Route 66) in St. Croix, U.S. Virgin Islands. Located on the south side of the island near the western end of St. Croix (Figure 1), the 3.5 acre site has a gently rolling topography ranging in elevation from 10 to 30 feet above sea level. The site is bordered on the north by an intermittent stream which originates on the north side of the island and discharges to the Caribbean Sea. Runoff from the site enters this unnamed intermittent stream.

The Caribbean climate is typical of the Neotropics. Temperatures vary from 70°-95° Fahrenheit with a relative humidity in excess of 60%. Winds are fairly constant at 10-20 miles per hour and are generally from the eastern quadrant as they pass over the Caribbean Sea. Seasonal rains in winter and summer are common. Hurricanes and tropical storms may occur at any time during the year, but are more likely during the summer and fall.

The surrounding area is predominantly commercial with five businesses adjacent to the site. Downwind, approximately one-quarter mile northwest of the site is the St. Croix Prison at Golden Grove (Figure 1). Several residences are located one-third mile north of the site at Upper Bethlehem and three-quarters of a mile northwest of the site at Golden Grove. South of the site (upwind) is one residence within one-tenth of a mile, a quarry, the Melvin Evans Highway and the Alexander Hamilton Airport.

The site property is currently owned by the Charles H. Steffey Holding Corporation. This landowner originally leased the land on a 30 year lease to Houston Chemical Industries on May 1, 1969. On March 20, 1972, Houston Chemical assigned the lease to Caribe Chemical Company, Inc. (subsequently known as Pierrel America, Inc.). On June 30, 1978, Pierrel America assigned the ground lease to Cooper Laboratories, Inc.. On July 21, 1978, Cooper Laboratories incorporated Island Chemical Company as its subsidiary to assume its production activities at the facility. On October 30, 1979, Cooper Laboratories assigned the lease to its subsidiary, Island Chemical Company. On November 1, 1979, Cooper Laboratories sold all of the stock of Island Chemical Company to the predecessor of Berlex Laboratories, Inc. (a subsidiary of Schering-Berlin Inc.). On September 14, 1984, Berlex sold Island Chemical Company assets and assigned the lease to Virgin Island Chemical Company (VIChem). VIChem is currently inactive and attempting to sell company assets and reassign the lease.

Prior to 1980, it is believed that the facility was used for the manufacture of pharmaceutical chemicals, primarily phenacetin, ethoxyquin and quinidine. Berlex reportedly used this facility to make quinidine gluconate used for the production of quinine. Quinine is an antimalarial medicine and flavoring in carbonated beverages. VIChem produced benzyl acetate by reacting benzyl chloride with acetic acid. Benzyl acetate is used in perfumes, flavorings, resins, lacquers, polishes, printing inks and varnish removers. In 1985, VIChem also began producing benzyl salicylate which is used as a perfume fixative, solvent for synthetic musk, sun-screening lotions and soap odorant.

In 1984, U.S. Resources and Chemicals, Inc. began leasing a portion of the facility from VIChem, and shortly thereafter started an alcohol dehydration operation. U.S. Resources transferred the lease and operation to VIAG Fuels, Inc. (VIAG). VIAG currently owns the alcohol dehydration process equipment and is presently inactive. According to David Weston, President of VIAG, there is an oral agreement between Chase Manhattan Bank (VIChem's mortgage bank), VIChem and VIAG in which VIAG currently provides site security. Also on-site at the present time is the St. Croix Security Kennels (SCSK). Dog kennels for 20 to 30 guard and attack dogs are present and the Secretary/Treasurer for SCSK lives on-site in a trailer.

B. Quantity and Types of Substances Present

The VIChem process facility was set up for batch and semi-continuous chemical manufacture. The process area, east of the maintenance and utility building (Figure 2) consists of two open-bay reactor areas and a centrifuge/dryer building. The six reactors are either glass-lined or stainless steel and are agitated, jacketed and have overhead condenser systems. Four of these reactors are also equipped with distillation columns. The centrifuge/dryer building contains various centrifuges, dryers, filters and grinding equipment. During the January 1989 preliminary assessment, inspection of accessible areas of the reactors and the centrifuge/dryer building revealed that they were empty of raw materials and product.

West of the main building is the tank farm which contains fourteen 8000 gallon tanks. Four of these tanks contain ethanol and one tank contains diesel fuel owned by VIAG and used to fuel their alcohol dehydration process. The remaining tanks in the tank farm are empty.

The main building and warehouse (areas 1,3,4,5 and 6 on Figure 3) contain approximately 400 drums (drum inventory, Table 2). Two hundred of these drums are labeled ethyl alcohol and half of these are empty. The condition of the ethyl alcohol drums varies from fairly sound to extremely deteriorated. Some of the other materials in the warehouse which are in deteriorated or leaking

containers include a cylinder of chlorine, one cylinder of hydrogen chloride, one unlabeled bulging drum, two drums with unknown contents in which a reaction has taken place causing the lids to come off and dispersing a white crystalline material, one drum of sulfamic acid which is broken and is leaking its contents.

The deterioration of these containers has been accelerated by leaks in the warehouse roof, causing portions of the warehouse floor to be flooded after it rains. The accumulation of rain water on the floor allows spilled materials to mix and is eventually discharged to the ground east of the warehouse near the septic tank.

The majority of the remaining drums contain flammable, poisonous, combustible or corrosive materials. Although some of these drums are in poor condition, they have not yet been severely impacted by rain water from the leaking roof.

The two laboratories within the main building (areas 11,15,18 — and 22 on Figure 3) contain over 800 laboratory reagent containers (lab inventory, Table 1). Some of the more dangerous materials within the labs are: sodium metal (water-reactive), ethyl ether (formation of shock-sensitive peroxides), diisobutyl aluminum hydride (air-reactive), potassium cyanide stored near acids (hydrogen cyanide air release), phosphorus pentoxide (water-reactive), sodium hydride (water-reactive), sodium borohydride (water-reactive), and approximately 75 unknown materials in reagent-size containers. At the time of EPA's removal site inspection on February 1, 1989, the water from the leaking warehouse roof had not affected the lab areas.

According to the June 1978 "Quinidine Sourcing Project" written for Cooper Laboratories and attached as Exhibit B to Civil Action No. 88-1346-Y "Certification of Michael C. Chester", both diisobutyl aluminum hydride and sodium metal were necessary for converting cinchona bark into quinidine gluconate. According to Exhibit C of this document, Cooper Laboratories experimented with this process from November 1978 to October 1979.

Table 3 lists materials on-site which are CERCLA hazardous substances and the statutory source for this designation. Table 4 lists toxicological effects of some of the compounds found at the site.

C. National Priorities List Designation

This site is not on the National Priorities List. It has not been submitted for ranking.

III. THREAT

A. Threat of Exposure to the Public and the Environment

Five categories of threats exist at this site: threat of fire/explosion, threat of direct contact, threat of an air release from the deteriorated hydrogen chloride and chlorine cylinders, the multiple threats posed by the leaking roof in the warehouse, and the improper storage of reactive hazardous materials at this inactive facility.

Neither of the two companies presently operating at the site (SCSK, VIAG) have qualified personnel to safely handle or monitor hazardous materials stored at the facility. The threat of exposure through direct contact, ingestion or inhalation exists for personnel employed by these companies. All personnel have free access to the labs and warehouse area. Tampering with some of the reactive materials or materials in deteriorated containers could result in serious injury or death.

Incompatible materials are stored in close proximity in the laboratories and the warehouse. In addition, the potential for adverse reactions is real and will continue to increase as the chemicals age in a hot and humid climate and are subject to persistent winds laden with saline moisture from the Caribbean Sea and rain water from the leaking warehouse roof. At least three examples of reactions taking place are evident in the drum storage area. These consist of one bulging drum and two drums in which an unknown crystalline material has exerted enough pressure to push open the drum lids and dispersed this material to the surrounding floor (photo #16). An unknown lab reagent has leaked its contents within one of the reagent storage closets (photo #10 and #11).

During a fire, explosion or air release from VIChem, nearby residences, businesses, the St. Croix prison and people using the Melvin Evans Highway could be severely impacted by toxic-laden smoke or plume. There are three fire departments on St. Croix which would respond to a fire at this facility. Although they have a number of self contained breathing apparatus, the required OSHA training is limited for qualified responders to hazardous material incidents.

In addition, there is another exposure pathway for direct contact and ingestion. Groundwater contamination by chloroform has been well documented by EPA for potable wells in the immediate vicinity of the VIChem facility. The March 13, 1986 RCRA Enforcement investigation, conducted by the Surveillance and Monitoring Branch, revealed chloroform contamination in the on-site production well. During March and November 1988, the Response and Prevention Branch conducted well sampling and

analyses at the nearby Fairplains wells. These wells are located between VIChem and the St. Croix prison and are a major source of drinking water on the island. Chloroform contamination was found in Fairplains wells number 6, 8 and 9 in concentrations ranging from 11 ug/l to 75 ug/l (ug/l=micrograms per liter). The Virgin Island Port Authority (VIPA) well number 2 is located approximately one-half mile west of the site and was also contaminated with chloroform at a concentration of 11 ug/l.

During the March 1986 RCRA Enforcement investigation, the inspectors observed four empty 55 gallon drums of chloroform. During the Response and Prevention Branch's site investigation in January 1989, one 55 gallon drum and one four liter bottle of chloroform were observed. There are no other known chemical industries in the Upper Bethlehem/Golden Grove area.

B. Evidence of Extent of Release

The warehouse area of the main building contains several drums which have leaked or are presently leaking. A 55 gallon fiber-drum of sulfamic acid has been extremely deteriorated by the flooding of the warehouse floor from the leaking roof (photo #17). Two unlabeled drums show signs of an uncontrolled reaction and have dispersed some of their contents to the surrounding warehouse floor (photo #16). Bags of tartaric acid have deteriorated and released some of the acid to the floor as well (photo #21). Several unlabeled drums are in such poor condition that any material in them has already been released (photo #19). There may be other releases which have occurred which are not as obvious as those presented in the photodocumentation. Air monitoring in the warehouse area during the initial entry in January 1989 revealed minor elevated readings on the organic vapor analyzer (1 to 2 units above background). No other elevated air monitoring readings were observed.

Leaks in the warehouse roof have allowed for the mixing of spills in the warehouse and their subsequent release to the environment. As the rain water accumulates on the warehouse floor it eventually reaches a point where the water flows out of the east side of the warehouse (areas 2 and 4, Figure 3) and is discharged to the soil adjacent to this area of the warehouse.

Investigations conducted by the Surveillance and Monitoring Branch (SMB) in 1985 and 1986 revealed that process waste water from the facility was discharged into the intermittent stream adjacent to the site. Analyses of sediments from this creek bed downstream from the discharge point showed that contamination consisted of xylene, di-n-octyl phthalate, 1,4-dichlorobenzene, 1,2-dichlorobenzene, naphthalene, fluorene, phenanthrene, aliphatic and aromatic hydrocarbons, arsenic, beryllium, chromium, copper, lead, nickel, antimony, and zinc. The on-site production well had detectable levels of arsenic, beryllium,

cadmium, chromium, copper, mercury, antimony, and zinc in addition to the previously mentioned chloroform contamination.

There are four possible sources for the contamination listed above. 1) A 17,000 gallon underground concrete pit used to contain production wastewater and sludges. This pit was abandoned and sealed with concrete in 1985. 2) The former wastewater drainage line leading from the process water pit to the intermittent stream was constructed of welded 55 gallon drums. This pipeline was excavated and replaced when it was discovered that numerous leaks and punctures had allowed wastewater to contaminate the surrounding soil. 3) Soil contamination as a result of leakage from a broken drainage line originating at a laboratory drain. 4) Spills associated with material transfer and tank or process line leakage.

C. Previous Actions to Abate Threat

As part of the sales contract with VICHem, Berlex (Island Chemical Company) was required to clean up any contamination present at the site. Berlex hired Enviro-Sciences, Inc. (ESI) of Denville, NJ, to survey the site and certify it as environmentally clean. ESI's sampling survey disclosed four areas of contamination. Two areas within the tank farm were found to be contaminated, primarily with toluene. This contamination was thought to be from process or transfer spills. The other two areas, underneath the concrete loading dock and a nearby trench were contaminated primarily with pyridine. This contamination is believed to be from the leaking laboratory drain. The quantity of contaminants was estimated at 125 pounds of toluene and 120 pounds of pyridine.

ESI recommended on-site treatment of the contaminated soil. The toluene contaminated soil was to be placed in a drying oven equipped with carbon filters, so that emission rates did not exceed the 200 ppm Threshold Limit Value (TLV) for toluene. The pyridine contaminated soil was to be treated by cutting the concrete pad and tilling the soil every two to three days and allowing the soil to aerate. A structure was to be built over the area to prevent soil saturation from rainfall.

During SMB's September 1986 investigation these two on-site treatment procedures were confirmed, however some discrepancies were noted from the process outlined above. The drying oven was employed for the volatilization of toluene from the soil, but the charcoal filters to absorb the volatilized material were not observed. The contaminated soil was tilled and aerated using a backhoe and then covered with a large synthetic liner. No permanent structure had been built to prevent future saturation of the soil from rainfall. The synthetic liner was not owned by Berlex but was rented. During RPB's January 1989 investigation

this area was covered by concrete and a new loading dock had been built. It is adjacent to the dog kennel area and trailer used for living quarters by the kennel operator.

In addition, on October 10, 1985, SMB was informed by Dr. A.L. Kyles, Vice President, Enviro-Sciences, that 192 55 gallon drums of waste were removed by Berlex for disposal. This material consisted of process pit water and sludge, drums and soil from the wastewater drainage line, one 55 gallon drum of water/toluene, and toluene contaminated soil. No copies of manifests were received to confirm these shipments. At the time (1985) an additional 33 drums of waste belonging to Berlex were staged on site awaiting sample analyses and disposal. Data on the sampling performed by Berlex was never received by SMB to confirm the clean up by Berlex. Also, the re-routing of existing laboratory discharges to a self-contained unit was not observed.

When Region II became aware of chloroform contamination in the public wells in St. Croix a health evaluation was conducted. According to the Agency for Toxic Substances and Disease Registry (ATSDR), chloroform is a B-2 carcinogen and has been shown to be a carcinogen in animals but not in humans. The Maximum Contaminant Level (MCL) for chloroform is 100 parts per billion (ppb). If other halogenated organics were present along with the chloroform, the 100 ppb MCL would be for all halogenated organics present. Chloroform contamination ranged from 11 to 75 ppb and no other contaminants were detected. Since the MCL was not exceeded, a CERCLA/SARA response was not initiated.

D. Current Actions to Abate Threat

The threat of direct contact to the general public is currently being limited by a perimeter chain link fence and site security maintained by VIAG and SCSK. There is evidence that at times the guard dogs are allowed to roam through the yard of the facility.

In a letter dated March 1, 1989, to Region II's New York/Caribbean Compliance Branch, Fred Schubert, President of VIChem, informed EPA that during his February 21-23, 1989 site visit "a small amount of non-contaminated rain water was swept out of the warehouse floor, the floors of the warehouse were swept and all sweepings were collected in an open head drum which was covered and remains on the site and a single five gallon pail of a laboratory solvent was placed in a second open head drum which was covered and remains on the site". No sampling/analyses were conducted to verify if the rain water or floor sweepings were contaminated. The type of laboratory solvent overpacked is unknown. Mr. Schubert also stated "non-chemical waste (empty boxes, waste paper, etc.) was removed from the site". Cans of paint were staged in one location outdoors.

IV. ENFORCEMENT

Berlex Laboratories, Inc. has submitted a work plan to EPA for the performance of environmental sampling at the site. The work plan is being finalized, after which it is expected that Berlex will implement the work called for by the work plan, pursuant to an Administrative Order to be issued by EPA.

On March 13, 1989, Notice Letters were sent to the following Potentially Responsible Parties (PRPs): Berlex Laboratories, Inc., Island Chemical Company, Inc., CHS Holding Corporation, Virgin Island Chemical Company, and VIAG Fuels, Inc.. None of these PRPs indicated that they were willing to conduct or finance a drum removal or other appropriate CERCLA response.

VIChem has indicated that it would not object to or obstruct EPA's performance of the removal action described herein. EPA will also seek VIAG's and SCSK's agreement to not operate or have personnel (or dogs) on-site during working hours of the removal action or if conditions at the site (stability) warrant evacuating the site of non-essential personnel. It may be desirable to have SCSK maintain site security during interim periods when EPA has temporarily demobilized for analytical and transportation/disposal coordination. The dog kennel is a very effective deterrent for potential trespassers or vandals. Further, EPA will seek to ensure that VIAG properly removes its numerous paint cans and two drums of water treatment chemicals at the site.

Four of the tanks currently contain ethanol. VIAG does not own this ethanol; however, they intend to buy this material when their company becomes fully operational. Enforcement Programs will seek assurances from VIAG that VIAG intends to buy the ethanol from the current owner of this alcohol, Ethanol Corp. of Birmingham, Alabama, and that VIAG will take responsibility for this material by using and storing it properly. This action will generate a cost savings to the Region in that 40,000 gallons of product will not have to be disposed of or recycled by EPA. The tanks appear sound and should provide continued safe storage of the ethanol.

V. PROPOSED PROJECT AND COSTS

A. Objective of the Project

The overall objective of this removal action will be to reduce the threat of fire, explosion, air release and direct contact.

The scope of this response will be to continue site security, stabilize reactive, leaking or weakened containers, and dispose of above ground containerized materials and resample public wells contaminated with chloroform.

For the purposes of planning, this response will be divided into three phases. The first phase of the project will involve activities at the site which reduce the most immediate potential for fire/explosion or air release and stabilize leaking and weakened containers. A security service will be provided during those times of the removal action when work is not being performed at the site. The activities and actions of the first phase are listed below.

Phase 1:

- 1) Stabilize, detonate/treat, or recycle air-reactive, water-reactive and shock-sensitive materials, and the deteriorated cylinders.
- 2) Sample and overpack or transfer to new drums all other containerized materials.
- 3) Contact potential recyclers in the Caribbean area (USVI and Puerto Rico) and coordinate recycling of usable product if possible and appropriate. Recyclers outside the Caribbean area may not be considered. This is due to the possibility of a recycler rejecting a product. If this were to occur with a United States mainland recycler, the cost of transportation from and back to the site would far exceed any potential cost savings to be realized through recycling.
- 4) Segregate materials by hazard class, and separate incompatible materials. Relocate and stage all overpacked containers in an area of the warehouse where they will not be impacted by rain water from the leaking roof. If dry warehouse space is limited, overpacked drums will be placed on pallets and covered with waterproof tarps.
- 5) Conduct sampling of the Fairplains and VIPA wells and analyze for chloroform contamination.

EPA will not make capital improvements to the main building by repairing the leaking warehouse roof. All sound and usable tanks will be left on site. Except for the 40,000 gallons of ethyl alcohol discussed previously, the contents of other tanks will be disposed of.

Any on-site treatment or detonation (on- or off-site) will be fully coordinated with the St. Croix Local Emergency Planning Committee (LEPC) and U.S. Virgin Islands Emergency Response Commission (VIERC). If these commissions are not established or fully functional by this time, these actions will be coordinated with the Virgin Islands Department of Planning and Natural Resources (DPNR) and appropriate emergency management agencies.

Phase 2:

- 1) Continue recycling efforts.
- 2) Conduct verification analyses for known materials and waste characterization for unknown materials or labeled materials which may have been tampered with.
- 3) Conduct disposal analyses for bulked unknown samples.
- 4) Based on this analytical information, coordinate the transportation and off-site disposal of all remaining materials.

Phase 3:

- 1) Continue recycling efforts.
- 2) Package and label containers for transportation to the pre-arranged disposal facility.
- 3) Site demobilization and discontinue site security.

Use of disposal facilities in Puerto Rico will be considered. However, these facilities may not be in compliance with appropriate RCRA regulations.

Due to the fact that transportation for off-site disposal will be by water carrier, all drums leaving the site will be overpacked or in new drums. Materials will not be bulked in tanks or sealed roll-off containers in order to avert the possibility of an adverse reaction occurring during transportation. The increase in cost due to this action will outweigh the risks associated with a mode of transportation which will take a relatively long period of time during which mixing by wave action on the ship and heat from the tropical environment persists.

B. Project Estimated Costs

The following synopsis of the estimated costs is based on information obtained from several sources. The ERCS cost data is based on the OSC's copy of the ERCS contract. Several OSCs and OSC Reports were consulted for on-site treatment cost estimates and typical costs for field purchases, rental equipment and other items while working in the Caribbean.

This is the first drum removal conducted in the U.S. Virgin Islands by Region II. Delays from the weather (rain storms, heat stress), supply and equipment deliveries, and other logistical complications are expected. Consequently, the ERCS contingency factor has been increased to 30%.

O.H. Materials will be the ERCS contractor for this removal, since they are the only Region II ERCS contractor to service the Caribbean area.

REMOVAL PROJECT CEILING COSTS

EXTRAMURAL COSTS

ERCS Cleanup Contractor	\$971,000
30% Contingency Factor	\$291,300
Rounded Mitigation Contracting Total	\$1,262,000
TAT Costs	\$105,000
Subtotal Extramural Costs	\$1,367,000
20% Contingency of Extramural Costs	\$273,400
Total Extramural Costs	\$1,640,400

INTRAMURAL COSTS

Direct Costs	\$50,000
Indirect Costs	\$150,000
TOTAL PROJECT CEILING	\$1,840,400
ROUNDED TOTAL PROJECT CEILING	\$1,840,000

C. Project Schedule

Approximately one month prior to the anticipated start date, the OSC and Response Manager from O. H. Materials will visit the site and review the scope of work, and develop strategies and a work plan. This will be necessary to determine which equipment and supplies will have to be shipped from the mainland.

Mobilization of equipment will take two weeks and mobilization of personnel will take two days. The first phase should take approximately three weeks. Analytical, transportation and disposal coordination will be the most time-consuming phase and may take six to eight months. After all disposal approvals have been obtained, the final phase for packaging, labeling and off-site shipment is anticipated to take three weeks.

All disposal activities will be conducted in accordance with CERCLA's off-site disposal policy and other applicable or relevant and appropriate regulations.

VI. RECOMMENDATIONS

Conditions at the VChem site meet the criteria for a removal action under 40 CFR 300.65(b)(2) of the November 20, 1985 National Oil and Hazardous Substances Contingency Plan (NCP). These criteria are:

- 1) Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals or food chain (Section 300.65(b)(2)(i));
- 2) Actual or potential contamination of drinking water supplies or sensitive ecosystems (Section 300.65(b)(2)(ii));
- 3) Hazardous substances or pollutants or contaminants in drums, barrels, tanks or other bulk storage containers, that may pose a threat of release (Section 300.65(b)(2)(iii));
- 4) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released (Section 300.65(b)(2)(v));
- 5) Threat of fire or explosion (Section 300.65(b)(2)(vi));

A removal action addressing containerized surface contaminants, pollutants and hazardous substances is consistent with Section 104(b)(2) of CERCLA as amended by SARA, in that this response will contribute to the efficient performance of long term remedial actions planned for this site.

The funds requested to initiate and complete this removal action will come from the Removal Advice of Allowance for Fiscal Years 1989 and 1990. Obligation of the necessary funds to complete this removal will occur in the first quarter of FY 1990. This action is in accordance with OSWER Directives 9360.0-18 and 9200.3-05.

I, therefore, recommend your approval of this request for a removal action under CERCLA as amended by SARA for the Virgin Island Chemical Company site. The estimated project ceiling for this removal is \$1,840,000 of which \$1,262,000 is for mitigation contracting.

Your authority to approve these project funds is pursuant to Assistant Administrator J. Winston Porter's May 25, 1988, redelegation memorandum, Delegation Number R-14-1-A.

APPROVED: William J. Porter

DATE: 8/8/89

DISAPPROVED: _____

DATE: _____

cc: (After approval is obtained)

J. Marshall, 2DRA
S. Luftig, 2ERR
R. Salkie, 2ERR-ADREPP
B. Sprague, 2ERR-RPB
M. Randol, 2OEP
E. Schaaf, 2ORC-NYCSUP
R. Gherardi, 2OPM-FIN
S. Anderson, PM-214F (EXPRESS MAIL)
T. Fields, OS-210
A. Smith, VIDPNR
C. Moyik, 2ERR-PS
L. Guarneiri, OS-210
J. Rosianski, 2OEP
P. McKechnie, 2IG
D. Henne, 2TATL

ATTACHMENT 1: ERCS CLEANUP CONTRACTOR COSTS

PHASE 1

Mobilization (personnel and equipment)	\$30,000
Personnel Costs (Labor, Per Diem, Travel)	\$180,000
Equipment (Trailers, Heavy Equipment, Monitoring Equip.)	\$32,000
Materials	\$18,000
Total Costs for Phase 1	<u>\$260,000</u>

PHASE 2

Analytical Services (includes transportation)	\$80,000
Contingency for Resampling	\$30,000
Total Costs for Phase 2	<u>\$110,000</u>

PHASE 3

Mobilization (personnel and equipment)	\$30,000
Personnel Costs (Labor, Per Diem, Travel)	\$90,000
Equipment (Trailers, Heavy Equipment, Monitoring Equip.)	\$15,000
Materials	\$16,000
Transportation and Disposal of Wastes	\$450,000
Total Costs for Phase 3	<u>\$601,000</u>
TOTAL MITIGATION COSTS	\$971,000



WESTERN

SPILL PREVENTION &
EMERGENCY RESPONSE DIVISION

EPA PM
KODAMA

FIGURE 1
SITE LOCATION

In Association with ICF Technology Inc., C.C. Johnson & Associates,
Inc., Resource Applications, Inc., Geo/Resource Consultants, Inc.,
and Environmental Toxicology International, Inc.

TAT PM
MENTZEL

VI CHEM SITE
ST. CROIX US VI

100344

TABLE 1

Laboratory Reagent Inventory

CHEMICAL NAME =====	COMPANY =====	QTY =====	STATE =====
1,3-dinitrobenzene	Aldrich Chemical	100 g	solid
1-butanol	J.T.Baker Chemical	500 ml	liquid
1-chlorobutane	MCB	4 L	liquid
1-propanol	J.T.Baker Chemical	500 ml	liquid
18-Crown-6 99%	Aldrich Chemical	25 g	solid
2,2-oxydiethanol	Kodak	1 kg	liquid
2,6-dimethoxybenzoic acid 99%	Aldrich Chemical	25 g	solid
2,6-ditertiarybutyl p-cresol	Biesterfeld	500 g	solid
2-hydroxybenzyl alcohol 99%	Aldrich Chemical	25 g	liquid
2-hydroxyethyl ether	Aldrich Chemical	1 kg	liquid
2-methyl-1-butanol 99%	Aldrich Chemical	10 g	liquid
2-methylbutyl amine	American Laboratorie	15 g	liquid
3,3-dimethoxy benzidene	Kodak	100 g	solid
3-hydroxybenzoic acid	Aldrich Chemical	100 g	solid
4-chlorobenzene sulfonamide	Aldrich Chemical	100 g	solid
4-hydroxy 4methyl 2pentanone	Aldrich Chemical	500 g	liquid
4-hydroxybenzoic acid	Aldrich Chemical	50 g	solid
4-methylbenzo phenone 97%	Aldrich Chemical	50 g	solid
9-hydroxyflourene	Aldrich Chemical	2x25 g	solid
Acetic acid	MCB	2x5 lb	liquid
Acetone	Fisher Scientific	4 L	liquid
Acetonitrile	Supelco	1 box	liquid
Alkalinity C,D,E,G	Mogul Corporation	4x2 oz	liquid
Aluminum Chloride	Mallinckrodt	1 lb	solid
Aluminum chloride	Witco Chemical	500 g	solid
Ammonium acetate	Fluka	1 kg	solid
Ammonium acetate	Aldrich Chemical	2 kg	solid
Ammonium acetate purified	Jarchem Industries	250 g	solid
Ammonium hydroxide	Sargent Welch Scient	500 ml	liquid
Ammonium persulfate	J.T.Baker Chemical	2.5 kg	solid
Ammonium persulfate	J.T.Baker Chemical	500 g	solid
Ammonium thiocyanate	Fisher Scientific	500 g	liquid
Amyl alcohol	Mallinckrodt	1 pt	liquid
Arsenic trioxide	Fisher Scientific	2x113g	solid
Barium chloride	Drew Chemical	1 qt	liquid
Barium chloride	Mallinckrodt	500 g	solid
Barium chloride	Fisher Scientific	1 lb	solid
Barium hydroxide	Fisher Scientific	1 lb	solid
Benzaldehyde	J.T.Baker Chemical	500 ml	liquid
Benzene	Tenneco Oil	2x1gal	liquid
Benzhydrol	Kodak	100 g	solid
Benzoic acid	Mobay Chemical	1 lb	solid
Benzoin	Fluka	2x1 kg	solid
Benzoin 98%	Aldrich Chemical	4x500g	solid

Laboratory Reagent Inventory

<u>CHEMICAL NAME</u>	<u>COMPANY</u>	<u>QTY</u>	<u>STATE</u>
Benzophenone	Aldrich Chemical	500 g	solid
Benzophenone	H&S Chemical	1 bag	solid
Benzophenone	Upjohn	500 g	solid
Benzophenone 99+%	Aldrich Chemical	50 g	solid
Benzoyl chloride	Mobay Chemical	1 lb	solid
Benzyl acetate 99%	Aldrich Chemical	100 g	liquid
Benzyl alcohol	Mallinckrodt	1 pt	liquid
Benzyl benzoate	Aldrich Chemical	100 g	liquid
Benzyl chloride	unknown	4 oz	liquid
Benzyl chloride	Velsicol	500 g	liquid
Benzyl cinnamate 98%	Aldrich Chemical	100 g	solid
Benzyl ether	Aldrich Chemical	1 kg	liquid
Benzyltriethylammoniumchlori	Aldrich Chemical	25 g	solid
Bismuth subnitrate	MCB	1 lb	solid
Bromine	Fisher Scientific	113 g	liquid
Bromophenol blue	Fisher Scientific	5 g	solid
Brucine sulfate	Fisher Scientific	1 oz	solid
Buffer solution pH 10.00	Fisher Chemical	500 ml	liquid
Buffer solution pH 4.00	Fisher Scientific	500 ml	liquid
Buffer solution pH 7.00	Fisher Chemical	500 ml	liquid
CAO-3 BHT	Sherwin Williams	1 bag	solid
Calcium sulfate anhydrous	W.A.Hammond Drierite	4x5 lb	solid
Cello-Seal	Fisher Scientific	25 g	liquid
Chloride F	Mogul Corporation	3 oz	liquid
Chlorodiphenyl methane 98%	Aldrich Chemical	100 g	solid
Chloroform	Fisher Scientific	4 L	liquid
Chromotropic acid Na salt	Fisher Scientific	25 g	solid
Cinnamaldehyde	unknown	2x1 kg	liquid
Citric acid anhydrous	J.T.Baker Chemical	500 g	solid
Citricacidtrisodiumdihydrate	Aldrich Chemical	1 kg	solid
Cobalt chloride	Fisher Scientific	2x1 lb	solid
Color standard 4	unknown	1 oz	liquid
Congo red	Fisher Scientific	25 g	solid
Copper metal	Fisher Scientific	500 g	solid
Cupric sulfate	Fisher Scientific	500 g	solid
Cupric sulfate	Mallinckrodt	500 g	solid
DPD #1,2,3 Reagents	Taylor Chemical	3x1 oz	liquid
Dibenzo 18-Crown-6 98%	Aldrich Chemical	50 g	solid
Dibenzoyl tartaric acid	Knoll Fine Chemicals	1 kg	solid
Dichloroethane 99%	Aldrich Chemical	1 kg	liquid
Dichlorophenyl methane 99%	Aldrich Chemical	25 g	solid
Dichlorotoluene 99%	Aldrich Chemical	100 g	solid
Diethylene glycol	Fisher Scientific	1 qt	liquid
Diisobutyl aluminum hydride	Texas Acres	4 cyl	gas
Diphenylmethane 99%	Aldrich Chemical	500 g	liquid

Laboratory Reagent Inventory

CHEMICAL NAME =====	COMPANY =====	QTY ---	STATE =====
Diphenylthiocarbazone	Fisher Scientific	25 g	solid
Eosin Y	Aldrich Chemical	25 g	solid
Ether anhydrous	Fisher Scientific	4 qt	liquid
Ethoxyguin	unknown	4 oz	liquid
Ethyl acetate	Aldrich Chemical	5 gal	liquid
Ethyl acetate	MCB	5x1gal	liquid
Ethyl benzene	Dupont	1 qt	liquid
Ethyl ether 99%	Fisher Scientific	6x500g	liquid
Ferric ammonium sulfate	Fisher Scientific	500 g	solid
Ferric chloride	unknown	100 ml	liquid
Ferric chloride	Fisher Chemical	1 lb	solid
Ferric chloride anhydrous	Pennwalt Corporation	5x500g	solid
Ferric chloride anhydrous	Kodak	500 g	solid
Ferrous ammonium sulfate	Fisher Chemical	1 lb	solid
Formic acid	unknown	200 g	liquid
Glacial acetic acid	Fisher Chemical	5 lb	liquid
Hydrazine sulfate	Fisher Scientific	4 oz	solid
Hydrazine sulfate	Fisher Scientific	100 g	solid
Hydrochloric acid	MCB	2x6 lb	liquid
Hydrochloric acid	Fisher Chemical	3x1 L	liquid
Hydroxylamine hydrochloride	Fisher Scientific	1 kg	solid
Hydroxylamine hydrochloride	MCB	4 oz	solid
Iodine	Fisher Scientific	500 g	solid
Iron chloride anhydrous	BASF	500 g	solid
Isoamyl alcohol	Fisher Scientific	500 ml	liquid
Isobutyl alcohol	J.T.Baker Chemical	500 ml	liquid
Lead acetate	MCB	1 lb	solid
Lead nitrate	Fisher Scientific	100 g	solid
Lithium perchlorate	Aldrich Chemical	500 g	solid
Magnesium sulfate	Fisher Scientific	500 g	solid
Medical oxygen	MSA	1 cyl	gas
Mercuric chloride	Fisher Scientific	2x100g	solid
Mercuric oxide	Fisher Scientific	500 g	solid
Mesityl oxide	Aldrich Chemical	100 g	solid
Methanol	Fisher Scientific	4 L	liquid
Methenamine	Fisher Scientific	500 g	solid
Methyl alcohol	Mallinckrodt	1 gal	liquid
Methyl orange	Fisher Scientific	113 g	
Methyl red	Fisher Scientific	2x10 g	solid
Monochlorobenzene	PPG Industries	10 oz	liquid
N-methylaniline	Kodak	1 kg	liquid
Na salt of ME salicylate	Sattra Chemical	1 bag	solid
Niacin N.F.	Nepera Chemical	250 g	solid
Nitric acid concentrated	J.T.Baker Chemical	2x8 lb	liquid
Nitrobenzene	Fisher Scientific	1 qt	liquid

TABLE 1

Laboratory Reagent Inventory

<u>CHEMICAL NAME</u>	<u>COMPANY</u>	<u>QTY</u>	<u>STATE</u>
Non aqueous buffer soln.	Beckman Instruments	1 pt	liquid
Nutrizyme	Merck	2 oz	solid
Oil #3	Frich Oil	5 gal	liquid
Paraffin oil	Fisher Scientific	1 qt	liquid
Paraformaldehyde	MCB	1 qt	liquid
Paraformaldehyde prills 91%	Celanese Chemical	1 lb	solid
Perchloric acid	MCB	2x8 lb	liquid
Phenol red	Fisher Scientific	5 g	solid
Phenolphthalein	Fisher Scientific	1 oz	solid
Phenylhydrazine	Fisher Scientific	4x4 oz	liquid
Phenylhydrazinehydrochloride	Fisher Scientific	2 lb	solid
Phosphorous pentoxide	Fisher Scientific	1 lb	solid
Piperazine	MCB	100 g	solid
Potassium bromide	Fisher Scientific	5x500g	solid
Potassium butoxide	Callery Chemical	50 g	solid
Potassium chloride	Beckman Instruments	2x6 oz	solid
Potassium cyanate	Fisher Scientific	1 lb	solid
Potassium cyanide	Fisher Scientific	500 g	solid
Potassium dichromate	Fisher Scientific	500 g	solid
Potassium ferrocyanide	Fisher Scientific	3 kg	solid
Potassium hydroxide	Mallinckrodt	2x1 lb	solid
Potassium hydroxide	Fisher Scientific	500 g	solid
Potassium iodide	Drew Chemical	1 qt	liquid
Potassium iodide	Fisher Scientific	2x500g	solid
Potassium periodate	Fisher Scientific	100 g	solid
Potassium platinate	Varlacold Chemical	5 g	solid
Potassium sulfate	Indiana Army Ammo Plant	250 g	solid
Potassium sulfate	Aldrich Chemical	500 g	solid
Potassium sulfate	unknown	50 g	solid
Potassium thiocyanate	Fisher Scientific	500 g	solid
Resorcinol	Koppers	3 bags	solid
Salicylaldehyde 99+%	Aldrich Chemical	100 g	liquid
Salicylic acid	Aldrich Chemical	100 g	solid
Salicylic acid	Aceto Chemical	500 g	solid
Salicylic acid sodium salt	Aldrich Chemical	100 g	solid
Sicapent	MCB	2.8 L	solid
Silica gel dessicant	Davison Chemical	2x1 qt	solid
Silver nitrate	J.T.Baker Chemical	1 oz	solid
Silver nitrate	Sargent Welch Scientific	30 g	solid
Sodium Chloride	Fisher Scientific	500 g	solid
Sodium acetate	Sattra Chemical	3 bags	solid
Sodium acetate anhydrous	Niacet Corporation	250 g	solid
Sodium acetate anhydrous	CDF Chimie Noth America	2x500g	solid
Sodium amide	Farchan Research Lab	500 g	solid
Sodium benzoate	Sattra Chemical	1 bag	solid

TABLE 1

Laboratory Reagent Inventory

CHEMICAL NAME =====	COMPANY =====	QTY =====	STATE =====
Sodium benzoate	Dastech International	1 bag	solid
Sodium benzoate	Ishihara Corporation	250 g	solid
Sodium benzoate	Pfizer	100 lb	solid
Sodium borohydride	Fisher Scientific	4x25 g	solid
Sodium carbonate	Fisher Scientific	1 kg	solid
Sodium carbonate anhydrous	Mallinckrodt	1 lb	solid
Sodium chlorate	Hooker Chemical	1 box	solid
Sodium dichromate	Fisher Scientific	10 kg	solid
Sodium formate	unknown	5 lb	solid
Sodium hydride	Thiokol/Ventron Division	1 lb	solid
Sodium hydroxide	Mallinckrodt	500 g	solid
Sodium metal	RMI	2 boxs	solid
Sodium nitrite	Fisher Scientific	2x500g	solid
Sodium nitro ferricyanide	MCB	4 oz	solid
Sodium sulfate	Fisher Scientific	500 g	solid
Sodium tartrate	J.T.Baker Chemical	2 oz	solid
Sodium tartrate	Fisher Scientific	6x113g	solid
Sodium thiosulfate	Fisher Scientific	2x1 lb	solid
Succinic anhydride	MCB	6x250g	solid
Succinic anhydride	Aldrich Chemical	2x1 kg	solid
Sulfamic acid	Fisher Scientific	500 g	solid
Sulfanilic acid	H&S Chemical	1 bag	solid
Sulfite O,P,Q	Mogul Corporation	3x2 oz	liquid
Sulfuric acid	J.T.Baker Chemical	10 lb	liquid
Tetraphenolboron sodium 99%	Aldrich Chemical	25 g	solid
Thiopene	Kodak	100 g	liquid
Total alkylinity indicator	Drew Chemical	1 qt	liquid
Tributyl borate	Aldrich Chemical	750 g	liquid
Trichloroethylene	Mallinckrodt	1 pt	liquid
Triethyl borate 97%	Aldrich Chemical	100 g	liquid
Triethylenediamine	Air Products	250 g	solid
Uranyl acetate	unknown	500 g	solid
Weedox C/R 250 herbicide	Southern Mill Creek Prod.	2x5gal	liquid
Xylene	Fisher Scientific	5x1 L	liquid
Zinc chloride	Fisher Scientific	500 g	solid
Zinc chloride anhydrous	Mineral Research	1 lb	solid
p-chlorobenzene sulfonamide	H&S Chemical	2 bags	solid
p-naptholbenzein	Fisher Scientific	25 g	solid
p-toluenesulfonicmonohydrate	Aldrich Chemical	500 g	solid
pH indicator A	Mogul Corporation	2 oz	liquid
z Miscellaneous unknowns	on site lab glassware	280bot	misc.
z Miscellaneous unknowns	on site one oz bottles	238bot	liquid

TABLE 2

Drum Inventory

Chemical Name =====	Company =====	Qty ===	State =====	Cond =====	Dates =====
Acetone	Ashland Chemical	55 G	liquid	good	
Acetylene	VI Gas	2 cyl	gas	good	
Activated carbon	Calgon Corporation	30 bag	solid	good	
All-weather patch material	Revere Chemical	55 G	solid	fair	
Amersite 2	Valley Freight Syst.	55 G	liquid	fair	
Ashland MeOH	Ashland Chemical	5 G	liquid	good	
Benzyl acetate	Island Chemical	21x55G	liquid	fair	
Benzyl chloride	Velsicol Corporation	28x55G	liquid	fair	
Chlorine	VI Gas	1 cyl	gas	poor	
Chloroform	unknown	55 G	liquid	good	
Crofox	Cerfact Laboratories	55 G	liquid	poor	
Crystal Clear floor finish	Cerfact Laboratories	2x20 G	liquid	good	
Degreaser	unknown	55 G	liquid	good	
Drewtrol 8500	Valley Freight Syst.	55 G	liquid	poor	
Ethyl alcohol	unknown	115x55	liquid	poor	
Filteraid	unknown	10x30G	solid	poor	
Glacial acetic acid	Celanese Chemical	13x55G	liquid	good	
Glycol	Island Chemical	20x55G	liquid	poor	1984
Humisorb	Culligan	30 G	solid	fair	
Hydrochloric acid	Certified Laboratory	55 G	liquid	poor	
Hydrogen chloride	VI Gas	1 cyl	gas	poor	
Insulation (asbestos??)	unknown	13 box	solid	good	
Insulation fiberglass	unknown	7 box	solid	good	
Lubricating oil	Texaco	2x10 G	liquid	good	
Lubricating oil	Texaco	5x55 G	liquid	good	
Magnesium sulfate trihydrate	Tomita Pharmaceutica	6x25kg	solid	fair	
Methanol	Ashland Chemical	5x55 G	liquid	good	
Methanol	unknown	3x55 G	liquid	fair	
Methyl isobutyl carbinol	Van Waters & Rogers	12x55G	liquid	good	1984
Methyl isobutyl ketone	Ashland Chemical	55 G	liquid	good	

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TABLE 2

Drum Inventory

Chemical Name =====	Company =====	Qty ===	State =====	Cond =====	Dates =====
Micro media filter sheets	Ertel Engineering	18 box	solid	good	
Oxygen	VI Gas	3 cyl	gas	good	
Oxygen	Santa Maria Gases	1 cyl	gas	good	
Paints	unknown	44x5 G	liquid	fair	
Paints	unknown	53x1 G	liquid	fair	
Paints	International Paint	97x5 G	liquid	fair	
Paints	International Paint	21x1 G	liquid	fair	
Para-phenetidin	unknown	55 G	liquid	fair	1983
Pentosin	Deutsche Pentosin	20 L	liquid	fair	
Potassium acetate	Jarchem Industries	8x100#	solid	good	
Potassium sulfate	unknown	50 bag	solid	good	
Powdered filter media	Ionics	2 boxs	solid	good	
Propane	unknown	4 cyl	gas	good	
Purafil II	unknown	15x10G	solid	good	
Quinine sulfate	Kimafarma	20 G	liquid	good	
Rinseline injector fluid	Bob Chamber Ltd.	55 G	liquid	good	
Rout	Cerfact Laboratories	20 G	solid	poor	
Salicylic acid	Rhone-Poulenc	27drum	solid	good	
Salt	unknown	2x30 G	solid	good	
Soda ash	Allied Chemical	15x100	solid	poor	
Sodium acetate anhydrous	unknown	50 lb	solid	good	
Sodium acetate anhydrous	Jarchem Industries	200 lb	solid	poor	
Sodium bicarbonate	Stauffer Chemical	8x100#	solid	poor	
Sodium hexa-meta phosphate	FMC	200 lb	solid	good	
Sodium hydroxide	Mantek	55 G	liquid	poor	
Sodium hydroxide	Manuel del Valle Inc	12x55G	liquid	good	
Spent toluene/acetone	unknown	2x55 G	liquid	fair	
Sterling salt crystals	unknown	50 lb	solid	poor	
Sulfamic acid	Dupont	400 lb	solid	poor	
Tartaric acid	Pfizer Chemical	15x100	solid	poor	
Thinner	unknown	6x1 G	liquid	fair	

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TABLE 2

Drum Inventory

Chemical Name =====	Company =====	Qty ===	State	Cond	Dates =====
Thinner	Advance	55 G	liquid	fair	
Toluene	Ashland Chemical	3x55 G	liquid	fair	
Toluene	unknown	5x55 G	liquid	good	
Triethylamine	Air Products	55 G	liquid	good	1984
Waste oil	unknown	2x55 G	liquid	good	
z Empty drums	unknown	130	n/a	fair	
z Miscellaneous unknowns	on site containers	25	misc.	poor	

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TABLE 3

CERCLA Hazardous Substances and
Statutory Codes (40 CFR Sec. 302.4)

<u>Chemical</u>	<u>Codes</u>
1,3-dinitrobenzene	1
1-butanol	4
3,3-dimethoxy benzidene	4
Acetic acid	1
Acetone	4
Acetonitrile	4
Ammonium acetate	1
Ammonium hydroxide	1
Ammonium thiocyanate	1
Arsenic trioxide	1,4
Asbestos	2,3
Benzene	1,2,3,4
Benzoic acid	1
Benzoyl chloride	1
Benzyl chloride	1,4
Chlorine	1
Chloroform	1,2,4
Copper metal	2
Cupric sulfate	1
Ethyl acetate	4
Ethyl benzene	1,2
Ethyl ether 99%	4
Ferric chloride	1
Ferrous ammonium sulfate	1
Formic acid	1,4
Glacial acetic acid	1
Hydrochloric acid	1
Isobutyl alcohol	4
Lead acetate	1,4
Lead nitrate	1
Mercuric chloride	2
Mercuric oxide	2
Methanol	4
Methyl alcohol	4
Methyl isobutyl ketone	4
Nitric acid concentrated	1
Nitrobenzene	1,2,4
Paraformaldehyde	1
Potassium cyanide	1,4
Potassium hydroxide	1
Resorcinol	1,4
Silver nitrate	1
Sodium hydroxide	1
Sodium metal	1

TABLE 3

CERCLA Hazardous Substances and
Statutory Codes (40 CFR Sec. 302.4)

<u>Chemical</u>	<u>Codes</u>
Sodium nitrite	1
Sulfuric acid	1
Toluene	1,2,4
Trichloroethylene	1,2,4
Triethylamine	1
Uranyl acetate	1
Xylene	1,4
Zinc chloride	1

1= Clean Water Act (CWA) Section 311 (b) 4

2= Clean Water Act (CWA) Section 307 (a)

3= Clean Air Act (CAA) Section 112

4= Resource Conservation Recovery Act (RCRA) Section 3001

TABLE 4

Summary of Toxicological Effects of
Some Identified Compounds

<u>Chemical Name</u>	<u>Health Effects Codes</u>
1,3-dinitrobenzene	A,B,E,I
1-butanol	A,E
3,3-dimethoxy benzidene	A,B,C,E,F
Acetic acid	A,I
Acetone	A,E
Acetonitrile	A,B,C,D,E,I
Ammonium acetate	A,E
Ammonium hydroxide	A,E
Ammonium thiocyanate	A,E
Arsenic trioxide	A,B,C,D,E,F
Asbestos	D,E,F
Benzene	A,E,F,I
Benzoic acid	A,E
Benzoyl chloride	A,E
Benzyl chloride	A,E
Chlorine	A,E
Chloroform	A,B,C,E,F
Copper metal	A,B,C,E
Cupric sulfate	A,E
Ethyl acetate	A,E
Ethyl benzene	A,E,I
Ethyl ether 99%	A,E,I
Ferric chloride	A,E
Ferrous ammonium sulfate	A,E
Formic acid	A,B,C,E
Hydrochloric acid	A,E
Isobutyl alcohol	A,E
Lead acetate	A,E
Lead nitrate	A,E
Mercuric chloride	A,E
Mercuric oxide	A,E
Methanol	A,E,I
Methyl isobutyl ketone	A,E
Nitric acid concentrated	A,E
Nitrobenzene	A,B,C,E,I
Paraformaldehyde	A,E
Potassium cyanide	A,E
Potassium hydroxide	A,E
Resorcinol	A,E
Silver nitrate	A,E
Sodium hydroxide	A,E
Sodium metal	A,E
Sodium nitrite	A,E,F
Sulfuric acid	A,E

TABLE 4

Summary of Toxicological Effects of
Some Identified Compounds

<u>Chemical Name</u>	<u>Health Effects Codes</u>
Toluene	A,B,C,E,I
Trichloroethylene	A,B,C,E,F,I
Triethylamine	A,E
Xylene	A,B,C,E,I
Zinc chloride	A,E

A= Eye, skin, respiratory and mucous membrane irritant
B= Liver damage
C= Kidney damage
D= Lung damage
E= Toxic by inhalation, ingestion, or dermal contact
F= Carcinogenic
G= Teratogenic
H= Mutagenic
I= Central nervous system effects

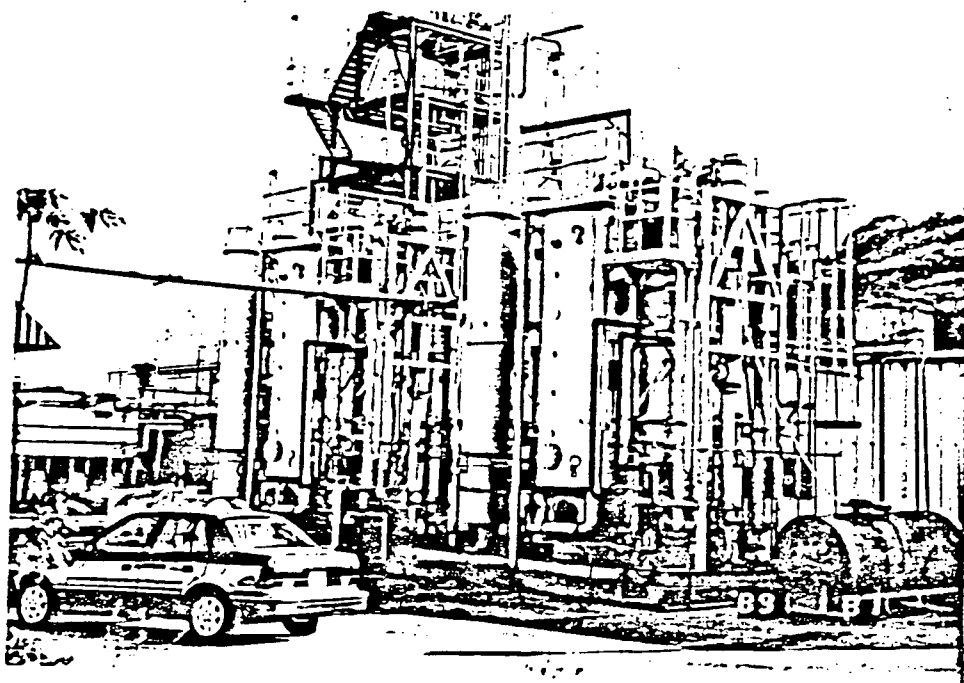


Photo #1. Virgin Island Chemical Company
Alcohol dehydration apparatus

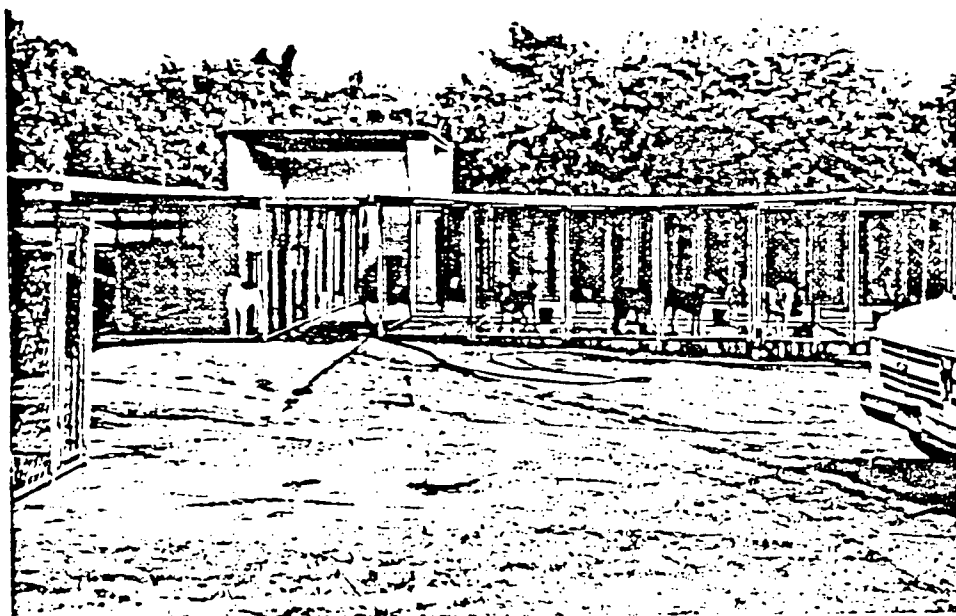


Photo #2. Dog kennel operating on site

100357



Photo #3. Maintenance building

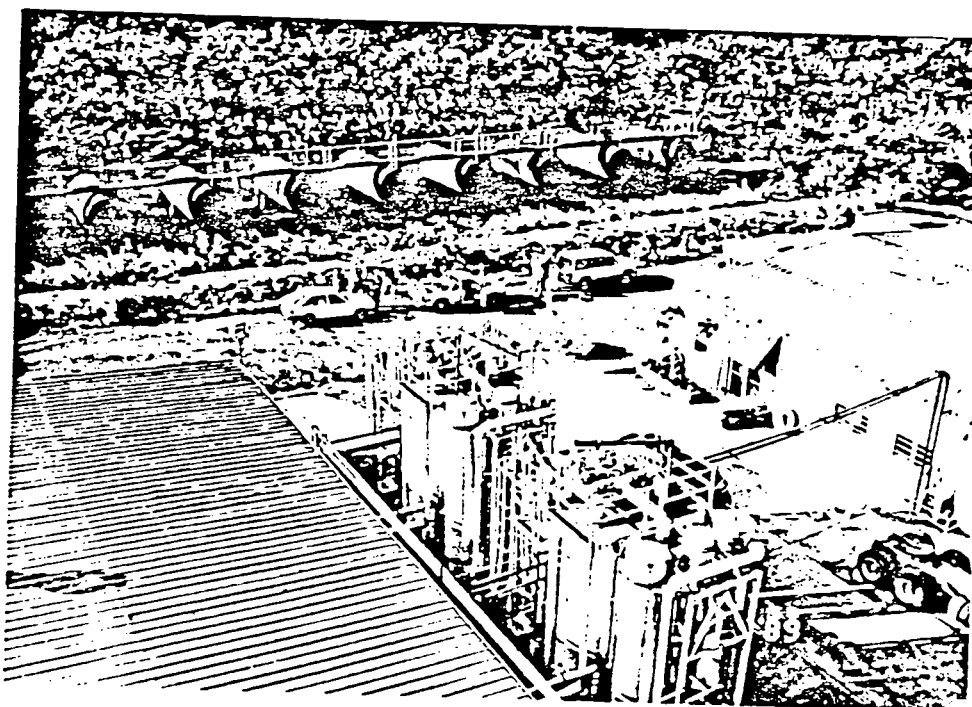


Photo #4. View of tanks, main building, and alcohol
dehydration unit

100358

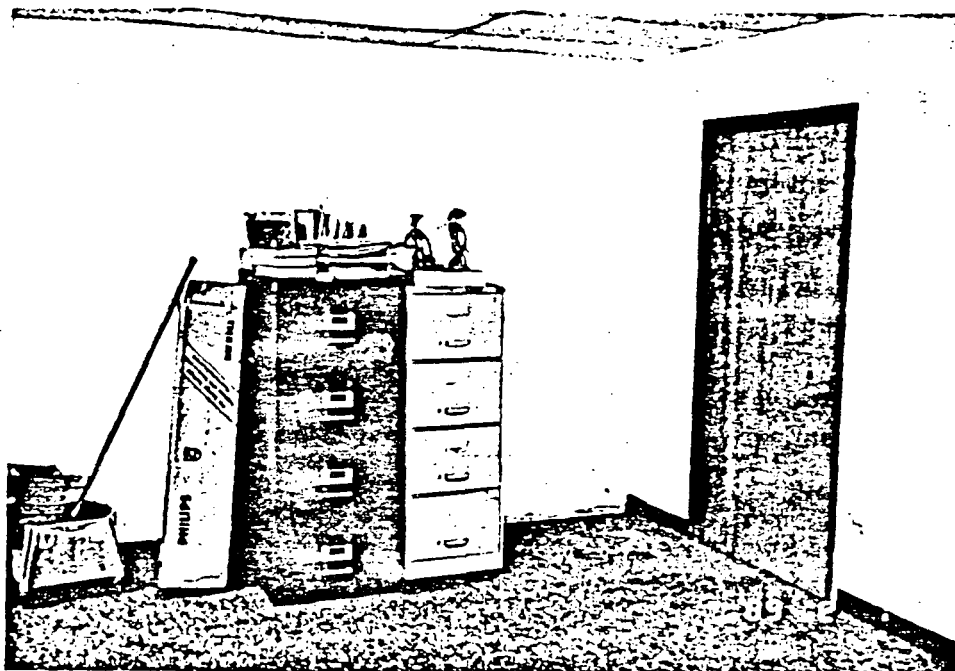


Photo #5. Main building office area 23

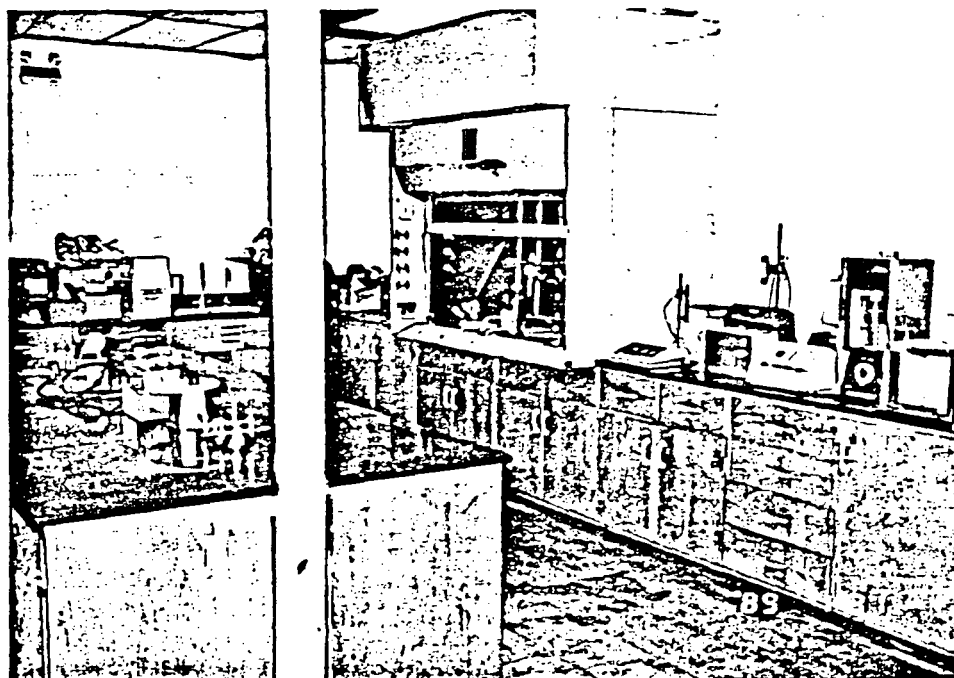


Photo #6. Area 22 lab in the main building

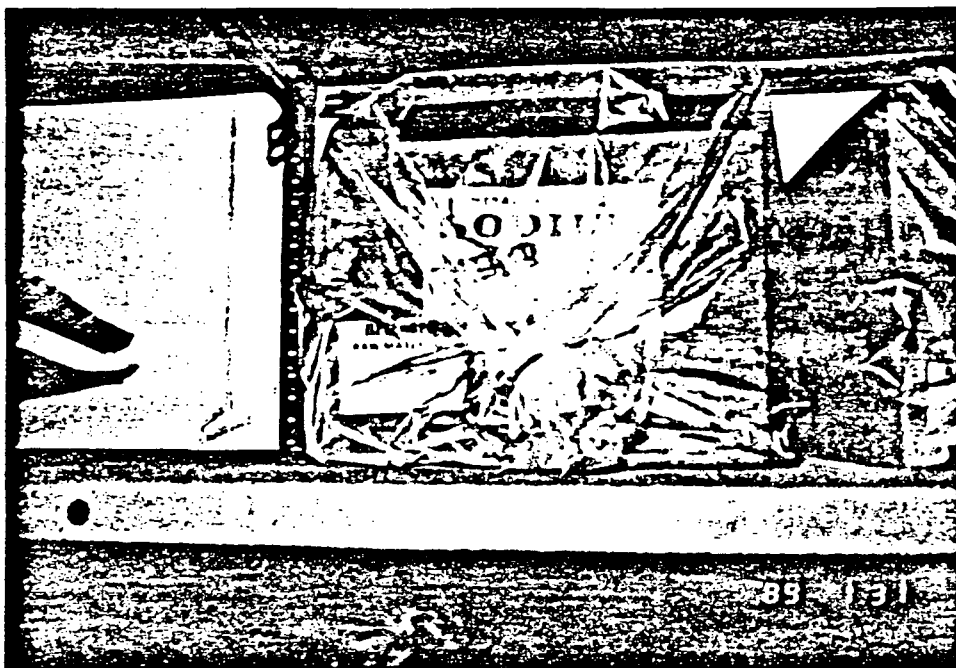


Photo #7. Virgin Island Chemical Company
Sodium metal in area 18



Photo #8. Area 18 chemical and glassware storage

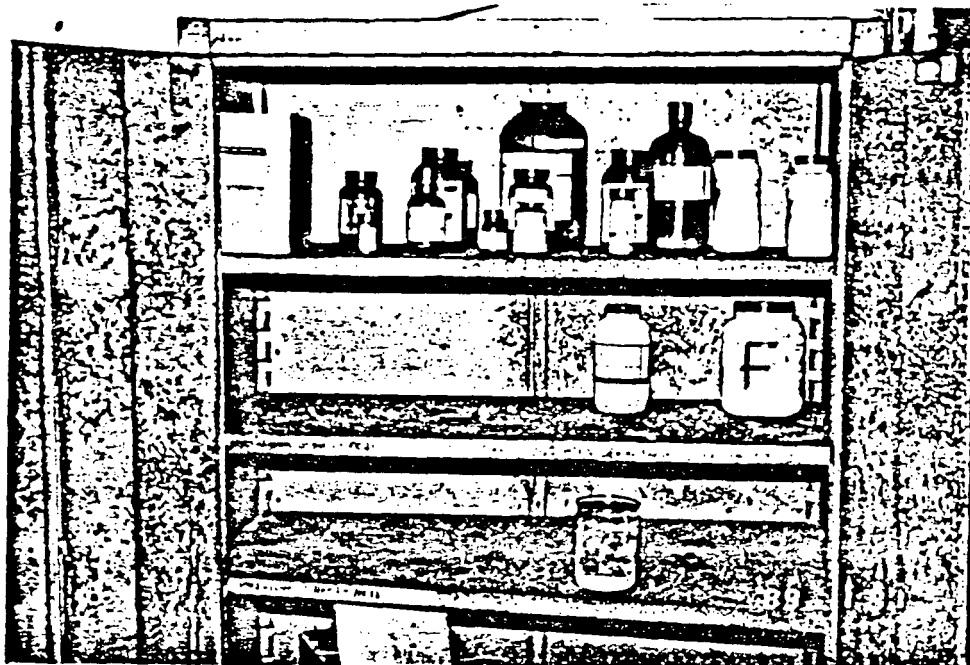


Photo #9. Incompatible storage of lab reagents



Photo #10. Incompatible and leaking storage of lab reagents



Photo #11. Incompatible and leaking storage of lab reagents



Photo #12. Incompatible storage of lab reagents

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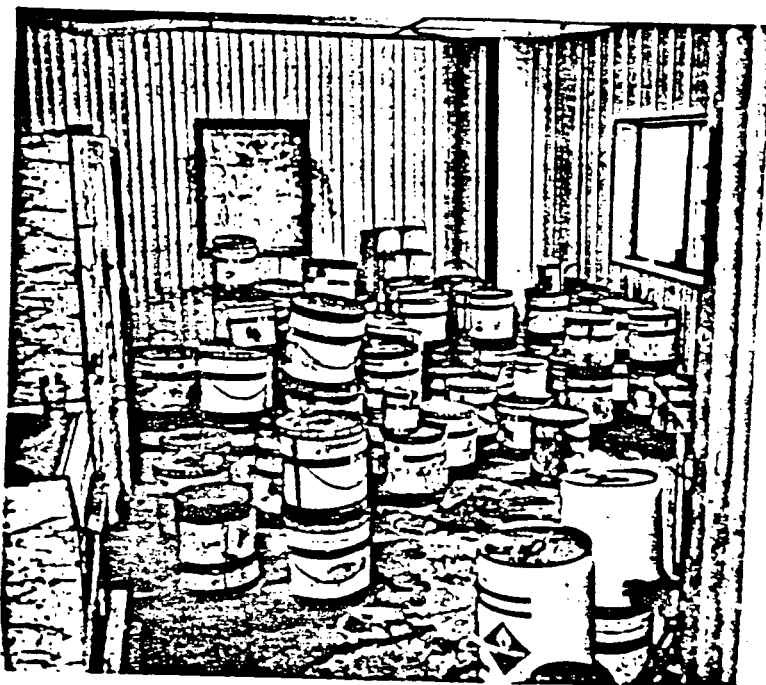


Photo #13. Paint cans in area 1



Photo #14. Cylinder of chlorine

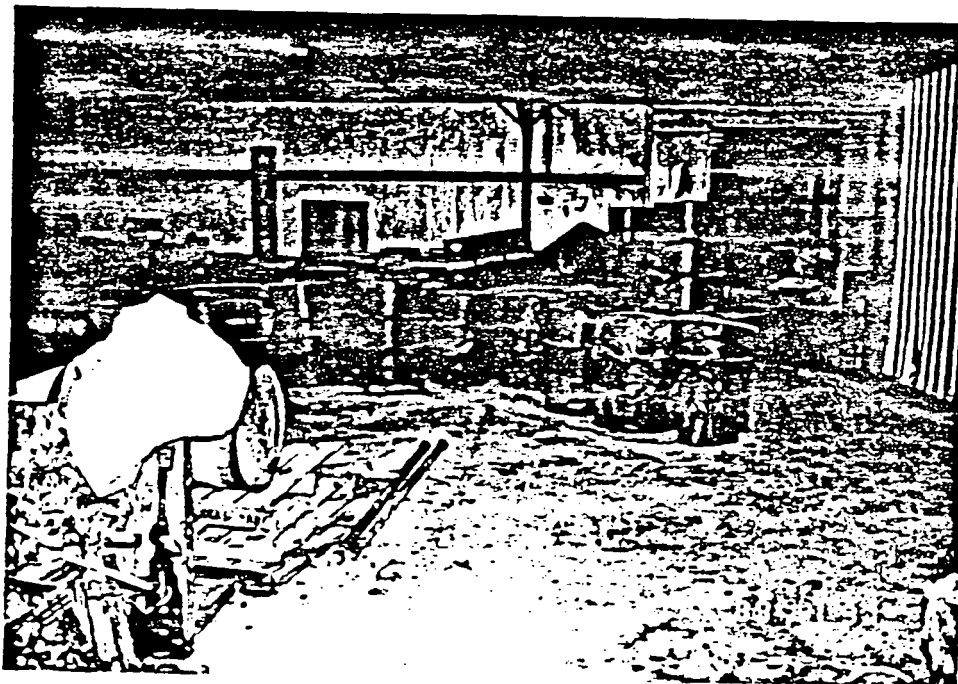


Photo #15. Drums in area 4; note water on the floor



Photo #16. Drum contents undergoing a reaction

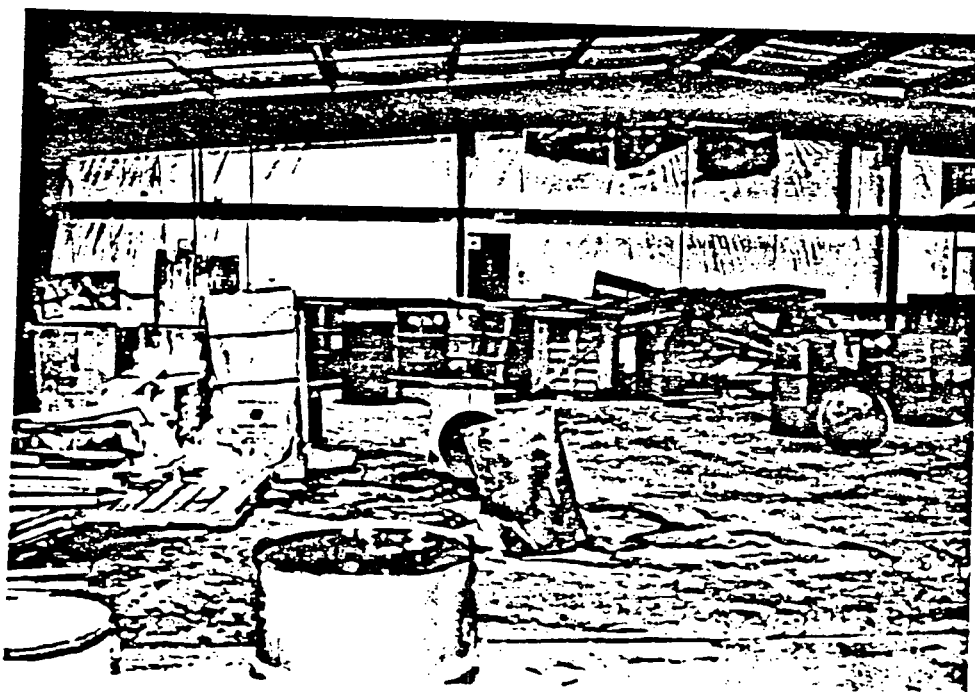


Photo #17. Virgin Island Chemical Company
Drums and debris in area 5

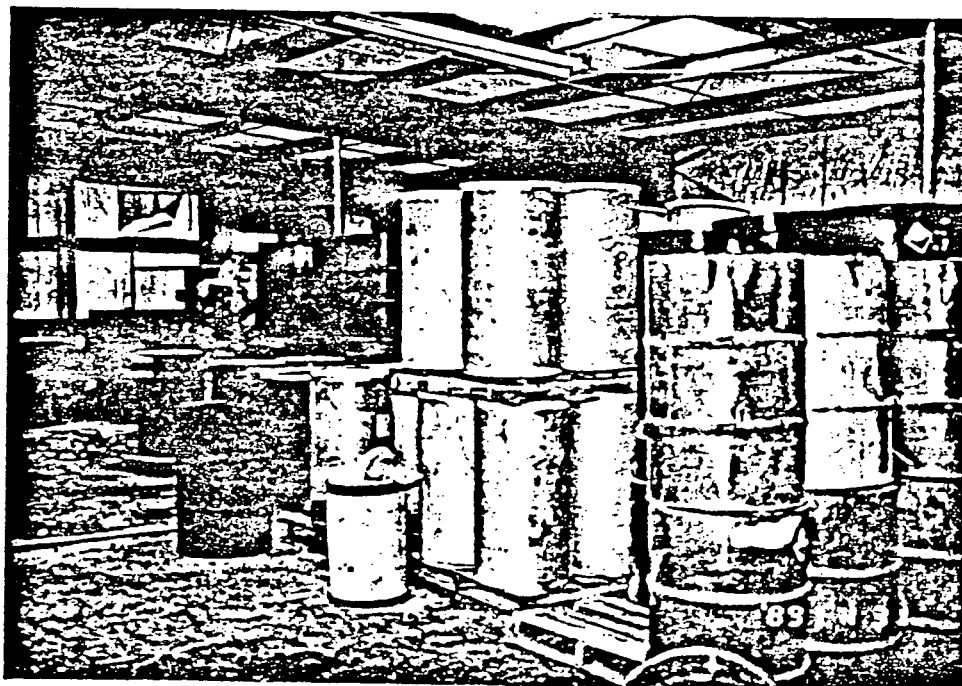


Photo #18. Drums in area 5



Photo #19. Deteriorating drums in area 6

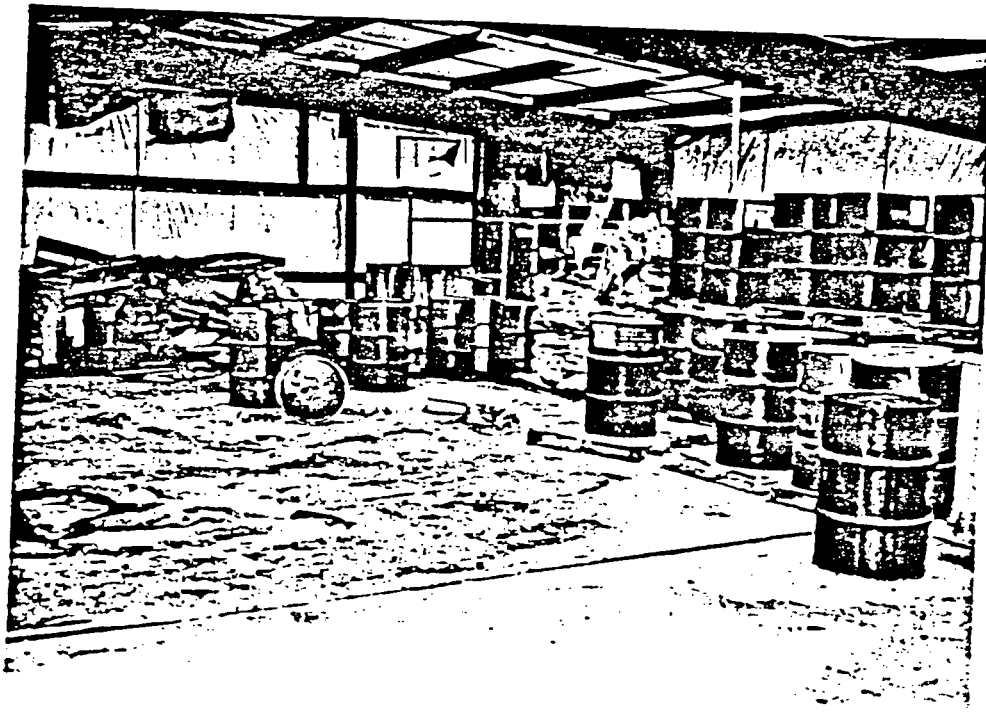


Photo #20. Drums and floor contamination in area 5



Photo #21. Deteriorating bags in area 6



Photo #22. Drums in area 6

REFERENCE NO. 2

100368

ATTACHMENT

SITE DESCRIPTION FOR
ISLAND CHEMICAL COMPANY
ST. CROIX, U.S. VIRGIN ISLANDS

April 16, 1987

100369

LIST OF TABLES

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4	Generalized Geologic Map of St. Croix
5	Schematic Hydrogeologic Cross-Section Parallel to Axis of Lower River Gut
6	Soils
7	Well Field Locations
8	Geology and Location of Wells in Fairplain Well Field Area, St. Croix
9	ICC Laboratory Pit
10	ICC Plot Plan: Trenches
11	ICC Plot Plan: Areas of Contamination
12	Contamination at Slab 3
13	Gut Sampling Program

APPENDIX

Appendix A: Soil Testing on ICC Site

ISLAND CHEMICAL COMPANY,
ST. CROIX, USVI

In connection with the sale of assets of Island Chemical Company (ICC) to Virgin Island Chemical Company (VICC), in October, 1984, Enviro-Sciences, Inc. (ESI) was retained to investigate the ICC site and, if found, remediate the contamination. ESI has conducted numerous site investigations and has remediated potential sources of contamination. All investigations and their results through February, 1986 have been submitted to the U.S. Environmental Protection Agency (USEPA), Region II for review and comment. (All backup information is available upon request from ESI.)

Site Description

Various aspects of the site are described in reports previously submitted to Region II: Progress Report, Island Chemical Company, Inc. (Berlex) St. Croix, Virgin Islands (December, 1984); and, Addendum to Progress Report, Island Chemical Company, Inc. (Berlex) St. Croix, Virgin Islands (April, 1985).

The facility is located on the island's south side and near the west end (Figure 1) at Latitude 17 42'26" and Longitude 64 47'25". It is situated approximately 6.1 miles equidistant from the two major towns: Frederiksted to the west and Christiansted to the east. Facility access is via Route 66 which traverses the island east and west. As seen in Figure 2, it is about 0.5 miles north of Alexander Hamilton Airport.

Elevation of the 3.5-acre site is approximately 30-40 feet mean sea level. The topography slopes from south to north with a 10-foot decrease in elevation.

During periods of heavy rainfall and runoff (Table 1), water flows from south to north across the western edge of the site (Figure 3), west of the berm. East of the berm the south to north flow is interrupted by a storm drain, located between the office building and maintenance shop, and diverted eastward off of the property. Additional flow is received by an open concrete duct and carried off-site east of the property.

A dry streambed (River Gut) which originates in the central portion of the island borders the northern and eastern boundaries. Flow occurs generally during the wet season (September through December) and only during heavy runoff (Table 1). The lower portion of the drainage lying beyond the facility is utilized as a sewage outfall. All surface runoff from the site flows into the streambed.

The major geologic formations exposed on the island are shown in Figure 4. The site is situated on alluvial deposits which have filled in the valleys. These deposits have attained considerable thickness along intermitant streambeds, especially River Gut, Salt River and Bethlehem Gut. A maximum thickness of about 100 feet occurs at the lower reach of River Gut.

The alluvium is mostly low permeable, [montmorillinitic] clay with thin (2 to 4 feet) interbedded lenses of terrigenous sand and gravel. Generally, the amount of sand and gravel increases seaward. A higher percentage of the sand and gravel deposits occurs in the intermitant streambed valleys. The degree of interconnection between these lenses is unknown; however, subsurface investigations indicate that many such lenses are isolated and limited in horizontal extent (Figure 5).

The principle aquifer for the Fairplain and Golden Grove public well fields is the River Gut alluvial deposits. Most groundwater appears to be under partially confined conditions. Upper sand layers in this area produce groundwater under unconfined or water table conditions, but the deeper sand may be artesian. Some researchers believe that water in the alluvium is confined and water table aquifers are not present. Discussions held with local well drillers, The Department of Public Works and visiting researchers, indicate that if groundwater flows in the site vicinity it is probably east to southeast along the flow direction of River Gut.

As shown in Figure 6, the facility is situated on soils of the Coamo Series. These are gently sloping, well drained soils which occur as alluvial fans and terraces. They formed in sediments derived from volcanic and limestone rocks. They range in texture from clay to sand. The upper layer is typically grayish-brown clay and clay loam. Permeability is slow to moderate, and the shrink-swell potential is moderate. These soils are commonly associated with San Anton, Glynn and Fraternidad soils. Soil characteristics for two on-site locations (glass reactor and water tank) are shown in Appendix A. Generally, the soils are typical of alluvial fans or terraces.

Potable water for distribution is supplied from both groundwater (30 percent) and desalted water (70 percent). However, the island is very dependent on storage (cisterns) to cope with water demands. Most private dwellings have their own roof/cistern systems for water supply.

There are eight major well fields on St. Croix and they are located as shown in Figure 7. The quality is generally poor due to mineralization and oil contamination from pump lubrication. These contaminants are often pumped into the supply system.

The location of the three closest well fields in relation to the facility are shown in Figure 8. The three fields contain 14 of the 37 total well field wells.

Wind direction is from the east and southeast (trade winds) with velocities ranging from 5-15 miles per hour.

Closest residences are located about 0.1 miles east of and upwind of the facility.

Facility History

Ownership

The 3.5-acre site is owned by Charles H. Steffey, Inc. On May 1, 1969 Steffey leased the property to Houston Chemical Industries, Inc. Houston Chemical assigned the lease to Caribe Chemical Co., Inc. (subsequently known as Pierrel America, Inc.) on March 20, 1972.

On June 30, 1978 Pierrel America assigned the ground lease to Cooper Laboratories, Inc. On October 30, 1979 Cooper Laboratories assigned the lease to its subsidiary, ICC. ICC was incorporated in Delaware on July 21, 1978. On November 1, 1979 Cooper Laboratories sold all of the stock of ICC to the predecessor of Berlex Laboratories, Inc.

Facility Description

The ICC facility was constructed during the early 1970's and is depicted in Figure 3. The site structures consist of a tank farm (14 aboveground tanks; maintenance building which houses boilers (2), refrigeration units, air compressors, and a shop; office/warehouse building which includes analytical laboratories, restrooms, storage room, dryer area and worker cafeteria; and production area which includes a centrifuge and dryer building, stainless steel reactor area, and glass reactor area. Additional ancillary facilities include two generator buildings, cooling towers, storage tanks (two, 4,000-gallon) and a 250,000-gallon water storage tank.

The glass reactor, associated concrete pad and concrete surface drainage diversion were added to the facility about 1979 or 1980.

Six of the original 20 tanks in the tank farm were sold locally during the early 1980's.

Septic tanks are used for all sanitary wastes. No process or laboratory wastes are connected to the septic system. Septic tanks are depicted in Figure 3; however, the exact location of the tank servicing the office restrooms is not known.

Laboratory wastes drained from both laboratories to a cobble-filled pit located below a concrete pad west of the warehouse. As shown in Figure 9, liquids would flow into the pit. This pit was connected via a 4-inch, PVC pipe to another cobble filled pit near the fence.

Any wastes from spills in the process area were collected by concrete channels and directed to an 8,000-gallon below grade, concrete tank. Any spills could be collected and reprocessed or cleaned and reused in the production process. The pit was connected via a 4-inch line

to a storm drain. This storm drain also drained storm runoff to the off-site gut via a drainline composed of 55-gallon drums welded end to end (Figure 3). Surface runoff from the concrete duct behind the glass reactor was via a 55-gallon drumline from the fence to the gut.

Water cisterns are located under the cafeteria in the main building, under the warehouse, and near the maintenance shop. All water is collected through the building gutter system. The primary use for cistern water is consumption, laboratory and domestic uses. However, most plant workers brought drinking water to the site.

Two wells (Figure 3) are present on the site (northwest corner and near water storage tank) for process water and fire fighting system. Both wells were installed by Schuster Services, St. Croix, USVI. However, well logs indicating depth to water, well screen location and other well information is not available.

Facility Operations

Prior to the acquisition of the leasehold by Cooper Laboratories, it is believed the prior owners used the site to manufacture phenacetin and ethoxyquin. Shortly before Berlex acquired ICC, and with it the leasehold and improvements, the facility was being used by Cooper to perfect a four-step process licensed from a French company to convert quinine, to its dextrorotary isomer quinidine. Cooper halted its work on the French process in mid-1979.

In late 1979, ICC began developmental work on a quinidine process based on available know how. It was not until October 1980 that sufficient planning and research had been performed on the process to warrant full staffing and personnel training at the facility. It was thus not until the end of 1980 that production of a pilot size batch was begun. In addition, after 1980, the plant also was used to reclaim quinidine.

From the end of 1980 until the end of 1982 ICC continued to experience production problems related to the purity and yield of the product and only during the last months of 1982 were anything more than pilot batches produced. Early in 1982, it was decided to abandon plans to use the site and the plant was permanently closed by the end of 1982.

In its experimentation with quinidine conversion and the reclamation of quinidine, toluene (including reclaimed Toluene) was used. Pyridine was never used in the process by ICC after acquisition by Berlex.

Two laboratories were present at the St. Croix facility. An analytical laboratory was maintained to test raw materials, and to conduct in-process and final product testing. A process laboratory was also present at the site for product development functions, primarily the small scale duplication (1-5 liter quantities) of steps in the process to work out problems and test improvements.

The process used by ICC after acquisition by Berlex was for the conversion of quinine to quindine which involved neutralization, oxidation, and reduction. At several steps in the process, toluene and reclaimed toluene was used. This toluene was recovered at every step. The entire amount recovered in every case was stored and reused when the process was rerun.

The same is true for the process used to recover quinidine from finished product. The toluene used in the process was recovered and reused when the process was run again.

Thus, the approximately 28,600 gallons of toluene on the site during ICC's use of the facility constantly was used in the two processes. At the time of the shut-down of the plant in December of 1982 by ICC, there was no further useful purpose for this material and it was manifested and shipped to Inland Chemical of Puerto Rico, Inc. of Manati, Puerto Rico, where it was burned.

Pyridine was used only in the process licensed by Cooper, which was run only once by ICC, at some date prior to the acquisition by Berlex. In addition, extremely small quantities of pyridine were on the ICC site for use as a reagent in the analytical and process laboratories.

At the time ICC acquired the St. Croix site, approximately 6,900 gallons of xylene mixed with p-phenetidine were present. This substance was a raw material used by a former owner. It was at no time used by ICC. After the plant shutdown, it was shipped to Philip Brothers Chemicals, Inc. in New York for sale. The sale unfortunately was not consummated and since no other purchaser could be found, the material was thereafter manifested as a hazardous waste and shipped to Inland Chemical in Puerto Rico for burning.

As noted above, ICC maintained analytical and process laboratories on the site. Small quantities of laboratory chemicals were present in each (see Table 2). Only very small quantities would be used at a time in laboratory procedures, e.g., a half pint or less at a time.

During the period of approximately two years when ICC operated, the only wastes regularly generated were those stemming from the process and analytical laboratories. These would total no more than a few gallons or so a quarter. Thus, ICC was a small quantity generator during this period.

Site Investigations

ICC site studies began in September, 1984 and have continued to March, 1986. These investigations are discussed below in chronological sequence.

A. Initial Site Investigation: September 11-20, 1984 Follow-up Investigation: October 23-28, 1984

Mr. Irving Cohen of ESI initiated the site investigations on September 11, 1984 and was replaced by Alan Kyles, Ph.D. on September 13. The initial phase continued through September 20, 1984. A second phase was undertaken from October 23 through October 31, 1984.

The entire property was walked and scrutinized for visible surface contamination. A backhoe was utilized to open trenches in areas where contamination might be expected. Most trenches were excavated to a depth of six feet. A portable Flame Ionization Detector (FID) was used to sense volatile organic compounds on the ground surface and faces of open trenches. (The FID has a detection range of 1 to 1,000 ppm). As the program progressed, a drill rig capable of boring concrete and split-spoon sampling was brought to the site.

Soil samples were taken from all trenched areas showing volatile organic contamination and from bore holes at various depths. All trenches were backfilled after investigations were completed.

Boring and trench locations are shown in Figures 9 and 10, respectively.

Results

The site evaluation procedures detected four areas of contamination. These are (Figure 11):

- 1) along trench number 4, under concrete slab number 3;
- 2) between tanks numbered 8 and 9;
- 3) along trench number 9; and
- 4) under the concrete surfaced loading dock.

The contaminated area located along trench 4 is shown in Figure 12. The contaminant had a distinct odor of toluene and exceeded a 280 ppm reading on the FID. However, gas chromatography sample analysis (Sample numbers S4 through S4-4) did not detect the presence of toluene or indicated levels of <0.2 ppm. These analyses were conducted by two separate laboratories. The time lag between sample taking and analysis (3 weeks) may account for the difference between field readings and laboratory analytical results.

A three- to four-foot wide section was removed from slab 3 to determine the extent of contamination. Inspection with the FID indicated that contamination was limited to this area and did not extend or penetrate the soil under slabs 2 and 4. Depth of contamination was restricted to the first two to three feet of soil.

All contaminated soil (approximately 4 cubic yards) was placed in 55-gallon drums and stored in the warehouse for eventual disposal. The pit was backfilled with clean soil.

The entire area between and in front of Tanks 8 and 9 was contaminated with toluene which escaped from Tank 8 during cleaning. Laboratory analysis indicated that Tank 8 contained a 1.4 percent solution of toluene and water and the surrounding soil and gravel mixture contained 694 ppm of toluene. Due to rain the prior evening and impending for later in the day, the area was cleaned. Soil and gravel was removed down to a depth of about one foot. At this depth a hard clay layer is present. All material, including water, was placed in 55-gallon drums and removed to the warehouse for later disposal. Sample analysis of the underlying clay soil indicated the absence of toluene.

When opening trench 9 behind the loading dock, a 4-inch PVC line was broken (Figure 9). Immediate odor indicated the presence of pyridine and the FID recorded in excess of 1,000 ppm when the broken pipe was probed. This pipe was dry, indicating no recent usage. Surface water settling in the open cut had a reading of 280 ppm. Further excavation and line tracing lead to a pit near the fence containing stones and covered with tin sheeting. Vapor emissions from the pit approached 800 ppm. Further excavation was discontinued for about 4 weeks until the return visit in October. Surface samples (Figure 9) were taken in the eroded trench which drains to the dry river bed and the excavated trench; pyridine, quinidine gluconate, and a quinine sulfate were present. A strong pyridine odor was prevalent during the excavation and sampling period.

Upon the return visit in October, the pyridine odor was not noticeable. Probing the pit and PVC pipe did not elicit a response on the FID. The pit was excavated without detection of organic vapors, especially pyridine.

Discussions with personnel who have been at the facility for a number of years revealed the past history for the loading dock area. Originally, laboratory drains exited from the building and wastes flowed directly to an open pit. Occasionally, during the rainy season the pit would fill with water and overflow by a swale to the dry river bed beyond the fence. Later, the pit was filled and the area concreted for use as a loading dock. It was uncertain how the laboratory drain was rerouted to the pit near the fence.

A total of 40 borings were made in the loading dock area; 22 during September and 18 during October. Most borings were at least 6-feet deep with a few being 8-feet deep. Table 3 shows the FID readings

for all samples taken during September. Soil texture indicates that contaminants are confined to sandy-clay material which was apparently used for fill. Samples taken from the dense clay below the sand were relatively free of contamination.

Analysis of soil samples from the pit area indicate the presence of were pyridine, toluene, fluorethyne, 2-methyl propanol, pentane, and 2-methyl-1-heptene. Again it appears that the volatile aspects of the soil samples had been lost.

The additional borings made in October further delineated the contamination and provided information on the laboratory drain routing under the concrete. Findings were confirmed using fluorescein dye. Apparently the laboratory wastes flow into a pit filled with stone near borings 20 and 20A. Once the pit fills, liquid overflows to an area near boring 16. Once this fills then flow continues out to the pit near the fence.

Samples were selected from these new borings and immediately analyzed. Analyses show the presence of at least 690 ppb toluene; 43,000 ppb pyridine; 64,000 ppb diphenyl methanone; and 600 ppb total xylene. Additional materials were present at lower concentrations. Oil and grease analysis indicated concentrations up to 1,500 ppm.

In summary, the loading dock area contained a varied mixture of materials. The contamination appears to be concentrated in the original pit area presently filled with sand. The underlying clay material has probably prevented downward percolation since the FID reading for clay samples are low. Also, the materials are highly volatile.

The findings of the investigation were submitted to Region II in December, 1984. ESI considered the cleaning of contaminated soil on site instead of removal to a certified landfill located on the mainland due to costs and low levels of contamination. Numerous alternatives were considered, including on-island incineration at the Hess Refinery. On-site decontamination was not only feasible but cost effective.

After considerable discussions with Mr. Robert Harris of Region II, an on-site treatment plan was submitted in April, 1985. The USEPA was notified in May that the proposed plan would begin during June.

June 6-15, 1985

Based upon analytical results, the pounds of toluene in the drummed soil was calculated to be about 120 pounds. The drummed soil was placed on trays in a dryer located on-site (Figure 3). Calculations were conducted to ensure that emission rates would not exceed 200 ppm TLV (calculated value 1-3 ppm). This concentration in air is not flammable. Soils with high and low concentrations were mixed for

uniform drying. All empty drums were triple rinsed and the wash water collected for later treatment or disposal. Soil samples were collected periodically during the drying process to monitor the decrease in levels of toluene.

The amount of pyridine and toluene calculated to be present under the concrete pad in the laboratory waste pit was 119 pounds and 4 pounds respectively.

ESI began treatment of the contaminated area behind the loading dock with the soil in place. This method involved the following sequence:

- 1) All laboratory waste flows were rerouted to a self contained unit thus preventing new contaminants and liquid from entering the area.
- 2) Portable toilets were available since the location of the septic tank was unknown. (Excavation proved the tank was not in this area.)
- 3) A shelter was constructed to prevent rainfall and runoff from entering the area.
- 4) All overlying concrete was removed to expose the contaminated soil, laboratory drains and pit.
- 5) A berm was constructed around the exposed soil to prevent inflow of water from rainfall.

These preliminary steps allowed for vaporization of volatile materials to the atmosphere. Periodically, the soil was turned using a backhoe to expose underlying soil layers. Samples were taken periodically to determine the rate of volatile release and confirm the success of the methodology employed.

Discussions with experts, indicated that pyridine will disappear upon exposure to air. They stated that although it is on the hazardous materials list it is biodegradeable in about 21 days if exposed to air and not in contact with water. The above precautions and methodology would allow for the biodegradation of pyridine. Also, other volatiles should disappear using this method.

ESI held a meeting with Mr. Alfred Williams and Mr. Austin Moorehead of the Department of Conservation and Cultural Affairs, St. Croix (809-773-0565). The concepts of this cleanup were discussed in its entirety and they consider the proposed methods to be suitable for the situation at the facility. They suggested that all work be coordinated through USEPA Region II.

Two (2) storm drainlines were excavated to replace the existing lines which were deteriorated and caving in at several locations. Both former lines were constructed of 55-gallon drums which were welded end to end. Excavation of the former line revealed one line contained a sludgy material with

an oily texture. This material was collected and placed in 55-gallon, open top drums (13 total) and stored until analysis indicated the constituents. Drums from the drainline were placed in a container for later disposal. No sludge or residue was present in the second drainline. The barrels from this line were placed in a container for later disposal. One line was replaced with 10-inch PVC pipe.

The excavation and replacement of each line was discussed with Public Works as to the need for an "Earth Change" permit. After review and inspection, Public Works did not require a permit for replacement.

During this field visit samples were taken from various areas and sent to stateside laboratories for analysis. These laboratories are Industrial Corrosion Management, Inc. (ICM) in Randolph, New Jersey and York Laboratories, Inc. (York in Monroe, Connecticut). Duplicates of most samples were sent to each laboratory as a quality control procedure.

The following samples were taken:

<u>Location</u>	<u>Type</u>	<u>Analysis</u>
Dryer	Soil	Toluene
Laboratory Pit	Soil	Pyridine
Drainlines	Soil	Volatile Organics
Process Pit	Sludge	Priority Pollutants + 40

To ensure the health of all personnel involved in the cleanup procedures, disposable protective clothing, including shoe coverings and hats were provided. The breathing apparatus was NIOSH approved masks with filters for organic vapors, acid gases and dust. The Scott part numbers and descriptions are listed below:

Respirator (half face)	TC-23C-174
Cartridge	642-0A
Dust Filter	642-F
Dust Filter Holder	642-FR

June 31 - July 3

The site was revisited and soil samples were taken from the dryer and the laboratory pit. The remaining six (6) barrels of toluene-contaminated soil were loaded into trays and placed in the dryer. In addition, liquid samples from the process pit were taken for Priority Pollutants + 40 analysis. However, they were lost in shipment and had to be retaken at a later date.

July 16 - 19

The site was revisited and samples were taken from the dryer and the laboratory pit. Priority Pollutants + 40 water samples were retaken from the process pit.

August 6 - 9

Additional sampling of the laboratory pit and dryer was conducted.

September and October, 1985

During September, the site was visited and samples of all waste streams (contaminated areas) were collected for shipment to Chemical Waste Management. This data is required before acceptance of wastes for disposal.

On September 17, the site was visited by Mr. Louis Diguardia, USEPA, Region II. He collected samples and discussed the site activities with Mr. Raymond Hays, a subcontractor at the site.

After Chemical Waste Management accepted the waste streams for disposal, the site was visited during early October to drum all materials for shipment and disposal. Attempts were made to dispose of washed drums locally through a verbal request to Austin Moorehead. He suggested I call USEPA Region II. The answer from Region II was to send a letter. Action time would have been 2-3 weeks. This was not pursued due to time costs. In addition, permission was sought by letter to evaporate process pit water instead of shipping off island. Mr. Moorehead responded to the letter verbally that this would require considerable time for approval.

At this same time, 192 drums of hazardous waste were packed, loaded and manifested to Chemical Waste Management for disposal.

January 30 - 31, 1986

With concerns about runoff from the facility to the gut, the site was visited and samples for metals and volatile organics were taken from 11 locations (Figure 13). Analytical results are summarized in Table 4.

Since metals were not used in any process by ICC, the metals present probably originate from the continual facility maintenance. Due to salt breeze, corrosion is a major problem throughout the Island. Maintenance workers continually chip and repaint the metal framework. The chips are washed into the gut during rainfall. In addition, an EP Toxicity test indicates the metals found were not leachable.

Volatile organic analyses showed that none are present.

February 20 - 28, 1986

The site was visited to containerize all hazardous materials and wastes owned by ICC for disposal. Thirty-three (33) drums of material were collected. Waste samples were collected for analyses by ICM to determine if the drummed materials were hazardous. On May 29, additional waste samples were collected and forwarded with waste material profile sheets to Chemical Waste Management, Inc., Emelle, Alabama. Since several items were not accepted in Alabama, waste profile sheets for S and W Wastes, Inc., New Jersey were completed. Upon acceptance of all materials by S and W Waste, manifests were completed and the wastes were shipped from St. Croix during March, 1987.

March 11 - 14, 1986

The USEPA, Edison, NJ office requested to sample several locations on and adjacent to the ICC site. Sampling was conducted on March 13. ESI was present to provide site information to the investigative team (Carol Price, Project Leader) and take split samples. Sampling locations were:

- 085-251-ESI - Northwest corner, in the gut (background)
- 085-252-ESI - In the gut behind the laboratory pit
- 085-253-ESI - In the gut just below the drainline outfall
- 085-254-ESI - The laboratory pit
- 085-255-ESI - The laboratory pit
- 085-256-ESI - The well in the northwest corner.

Priority Pollutants + 40 (PP+40) analyses (except metals) were conducted by ICM on the first 5 samples; PP+40 was conducted on the well sample. No contaminants were found.

Summary

ESI has conducted a site investigation for contamination during the prior one and one-half years. Five (5) locations were found:

- 1) Between storage tanks 8 and 9,
- 2) End of slab No. 3,
- 3) Process pit,
- 4) Drainline, and
- 5) Laboratory pit.

Remediation of the first four (4) areas consisted of containerizing, waste analyses for disposal, manifesting, and disposal at the Chemical Waste Management, Inc. facility in Emelle, Alabama. Remediation of the laboratory pit involved biodegradation through soil manipulation.

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(Ak86269)

TABLE 1 TEMPERATURE AND PRECIPITATION

[Data from Alexander Hamilton Field, St. Croix]

Month	Temperature				Precipitation			Average number of days with more than one-tenth of an inch of rainfall
	Average daily maximum	Average daily minimum	Average maximum	Average minimum	Average total	One year in 10 will have--		
						Less than--	More than--	
	<u>°F.</u>	<u>°F.</u>	<u>°F.</u>	<u>°F.</u>	<u>In.</u>	<u>In.</u>	<u>In.</u>	
January----	83	70	86	65	2.23	0.50	7.2	5
February---	83	70	86	66	2.19	.44	5.8	6
March-----	84	71	86	66	1.73	.40	4.6	4
April-----	86	73	88	68	2.83	.55	7.6	6
May-----	86	74	89	70	4.31	.60	8.2	8
June-----	88	76	90	71	3.10	.58	6.0	9
July-----	88	76	90	71	3.51	.80	6.6	8
August-----	89	76	91	72	4.58	1.20	8.8	9
September--	88	75	91	71	6.65	2.20	11.0	10
October----	88	75	90	70	5.45	1.60	10.2	8
November---	86	73	89	68	4.65	1.20	9.0	9
December---	84	72	¹ 87	² 67	3.34	1.00	8.6	9
Year----	86	73	¹ 92	² 64	44.57	34.00	53.8	91

¹ Average annual highest temperature.² Average annual lowest temperature.

TABLE 2

Inventory and Laboratory Items at ICC

Quinine Sulfate
Quinidinone
Quinidine Base
Quinidine Gluconate
Quinact
Quinine Bisulfate
THF (Tetrahydrofuran)
Toluene
Pyridine (Karl Fisher Reagent)
Isopropanol
Sodium Chloride
Ethyl Alcohol
Benzylphenone
Chloroform
Methylene Chloride
Cinchona Bark
20% Dibah in Toluene
Sodium Hydroxide (caustic soda)
 pellets and solution
Glucono- Δ -Lactone
Liquid Ammonia
Muriatic Acid
Sulfate Acid

Sodium Hypochlorite Solution
Sodium Bicarbonate
Magnesium Sulfate
Flourenone
Potassium-t-Butoxide
Acetone
Calcium Hypochloride (H-T-H)
Tetaric Acid
Variquat
Acetic Acid
Soda Ash
Gluconofin
Carbon Black
Kenite 700
Potassium Iodo Platinat
Butylated Hydroxy Toluene
Ethylene Glycol
Methanol
Charcoal
Castor Wax
Acetic Anhydride
Acetonitrile
Xylene
Ethyl Benzene
Butanol
Butyl Chloride
Diethylamine
Triethylamine

TABLE 3

FID READINGS (ppm) FOR ISLAND CHEMICAL COMPANY

Boring No.	1 Foot Depth			3 Feet Depth			4 Feet Depth			6 Feet Depth			8 Feet Depth		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1	-	10	10	10	0	10	20	20	15						
2	10	10	0	10	40	60	10	0	10						
3	0	0	0	0	10	0	45	25	40						
4	-	-	-	20	80	15	100	120	90						
5	110	30	110	15	45	-	-	15	10						
6	55	150	30	10	210	200	45	60	45						
7	60	110	110	160	45	150	80	0	0						
8	90	10	10	10	20	15	0	0	0						
9	200	10	10	55	0	0	0	0	0						
10	0	0	0	0	-	10	0	0	0						
11	0	0	0	10	10	30	10	10	10	0	0	0			
12	10	0	25	20	20	10	40	15	20	0	0	0			
13	100	100	100	140	250	90	100	100	300	30	25	150			
14	100	80	80	45	100	60	65	100	100	40	25	55			
15	10	-	-	10	20	0	10	15	40	0	0	0			
16	45	10	10	300	300	110	320	160	200	10	10	10	10	10	10
17	30	35	40	40	20	30	10	10	10	-	-	-			
18	-	10	30	80	45	45	40	15	45	-	-	15			
19*	20	65	X	X	X	X	-	20	15	-	-	-			
20**	300	200	100	SP	SP	SP	SP	SP	SP						
21***	110	n/a	n/a	120	310	100	130	1000	680						
22	15	15	10	0	35	30	0	0	0						

1/ Sampled during September.

* X = No Sample

**SP = Septic Pit

***At the 4 Feet Depth, Letter B should read 1000 plus.

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TABLE 4

Heavy Metal Analyses For "Gut" Samples

<u>Location</u>	<u>Cadmium</u>	<u>Chromium</u>	<u>Copper</u>	<u>Lead</u>	<u>Mercury</u>	<u>Zinc</u>
G-1 ¹⁾	LT 0.24	14.5	37.3	21.0	LT 0.092	63.1
G-2	LT 0.23	16.4	38.3	22.0	LT 0.103	57.8
G-3 ²⁾	LT 0.22	16.7	33.8	14.5	LT 0.101	129
G-4	LT 0.22	12.0	25.3	13.2	LT 0.102	37.1
G-5	LT 0.23	17.1	36.1	20.2	LT 0.105	57.2
G-6 ³⁾	1.0	46.4	40.0	32.9	LT 0.122	349
G-7 ³⁾	2.4	71.1	51.4	46.4	LT 0.121	861
G-8	LT 0.23	20.4	32.8	19.4	LT 0.093	76.2
G-9	LT 0.23	19.8	34.9	21.4	LT 0.113	75.7
G-10	LT 0.30	30.6	62.7	16.5	LT 0.106	66.5
G-11 ⁴⁾	LT 0.54	41.1	69.7	12.8	LT 0.194	871

1) G-1: Background - above plant site.

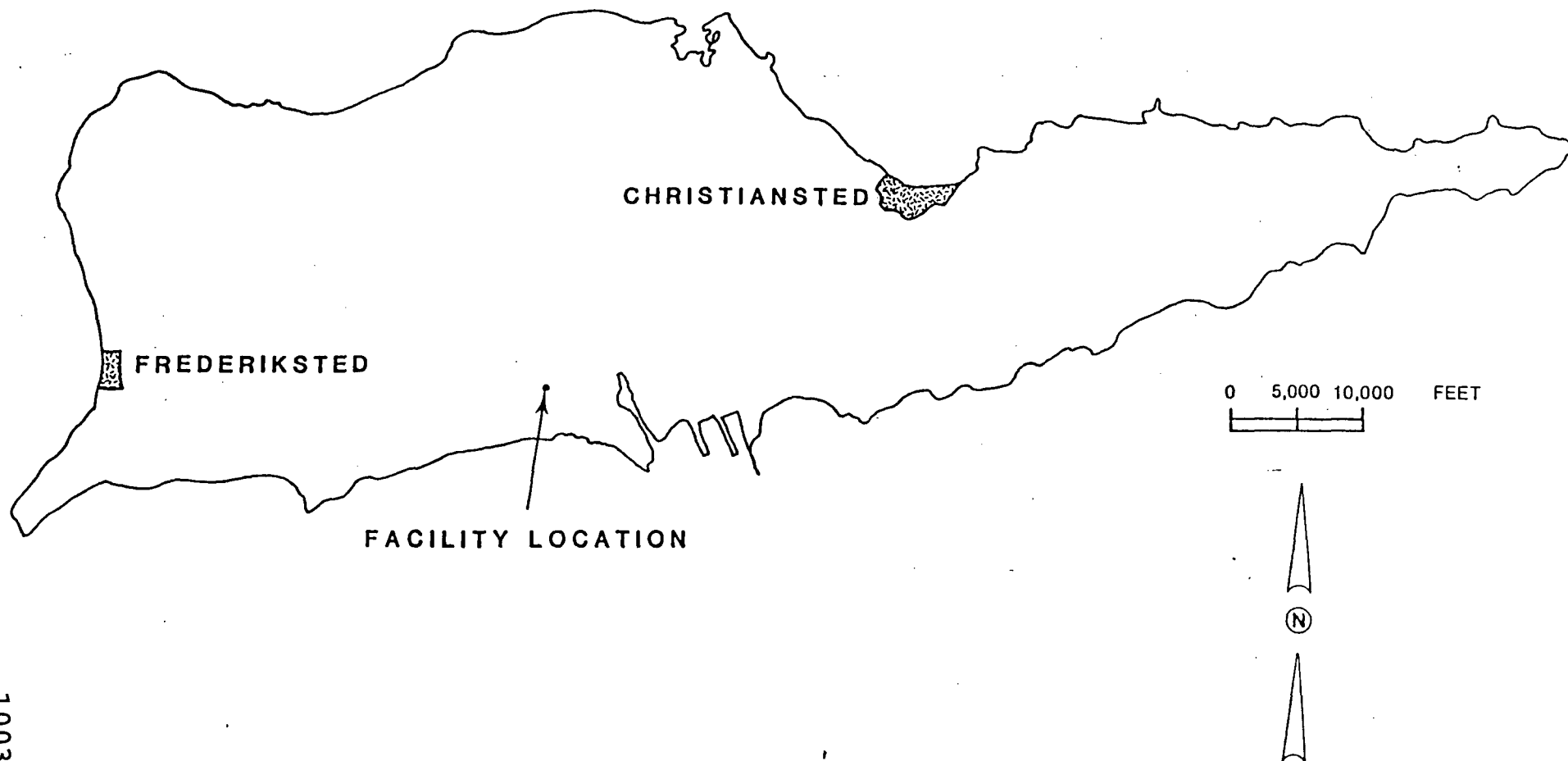
2) G-3: Just below Laboratory pit outlet to the gut.

3) G-6 and G-7: At point of drain line discharge.

4) G-11: Settling "basin" area in gut 300-400 feet beyond drainline discharge point.

FIGURE 1

FACILITY LOCATION MAP



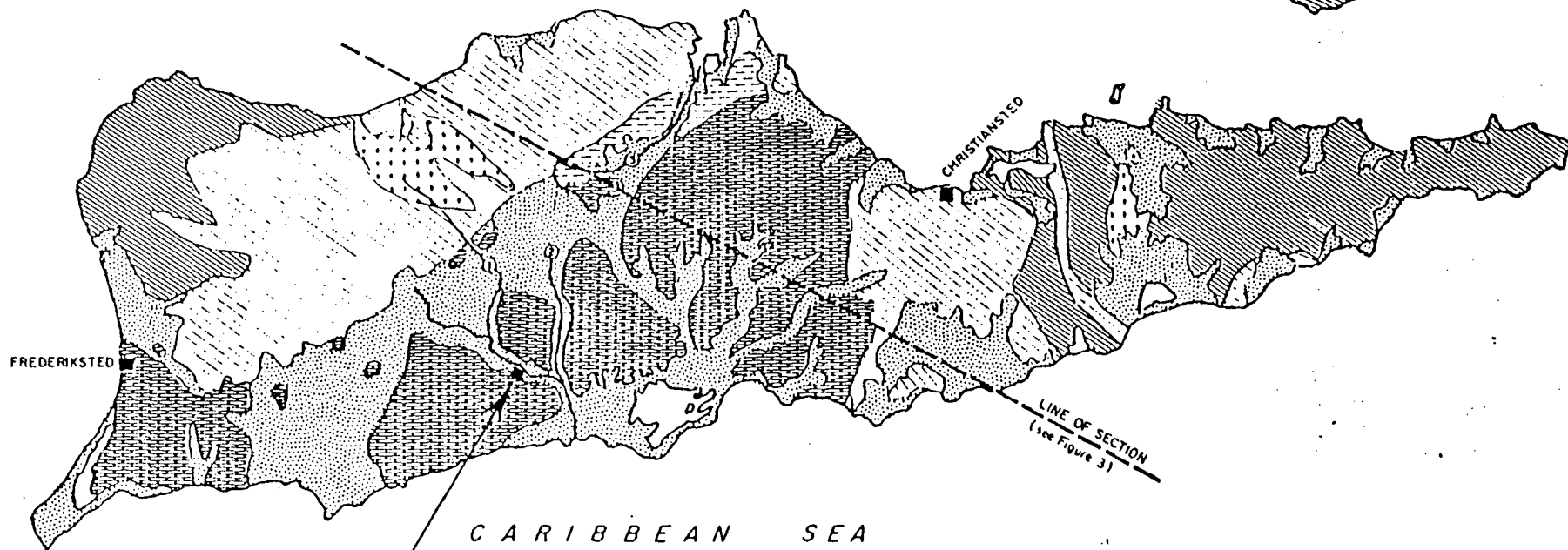
SOURCE: COMPREHENSIVE WATER RESOURCES
MANAGEMENT PLAN FOR THE UNITED
STATES VIRGIN ISLANDS, 1983.

100388

[illegible]



C A R I B B E A N S E A



FACILITY LOCATION

0 1 2 MILES

EXPLANATION

	ALLUVIUM AND BEACH DEPOSITS
	KINGSHILL AND YOUNGER LIMESTONE
	JEALOUSY FORMATION
	TUFFACEOUS FORMATIONS
	CALEDONIA FORMATION
	INTRUSIVE IGNEOUS ROCKS

①	RIVER GUT
②	BETHLEHEM GUT
③	SALT RIVER

NOTE: MODIFIED AFTER WHETTEN
(1966, 1974)

SUBJECT

GENERALIZED
GEOLOGIC MAP OF
ST. CROIX

PREPARED FOR
GOVERNMENT OF U.S. VIRGIN ISLANDS--
CONSERVATION AND CULTURAL AFFAIRS

Geraghty & Miller, Inc.	COMPILED BY	DANIEL HACHMAN	SCALE SHOWN DATE	FIGURE 2
	PREPARED BY	BILL CICIO		
	PROJECT MGR	WILLIAM BOIS		

Source: Geraghty & Miller, 1983

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(Joins sheet 26)

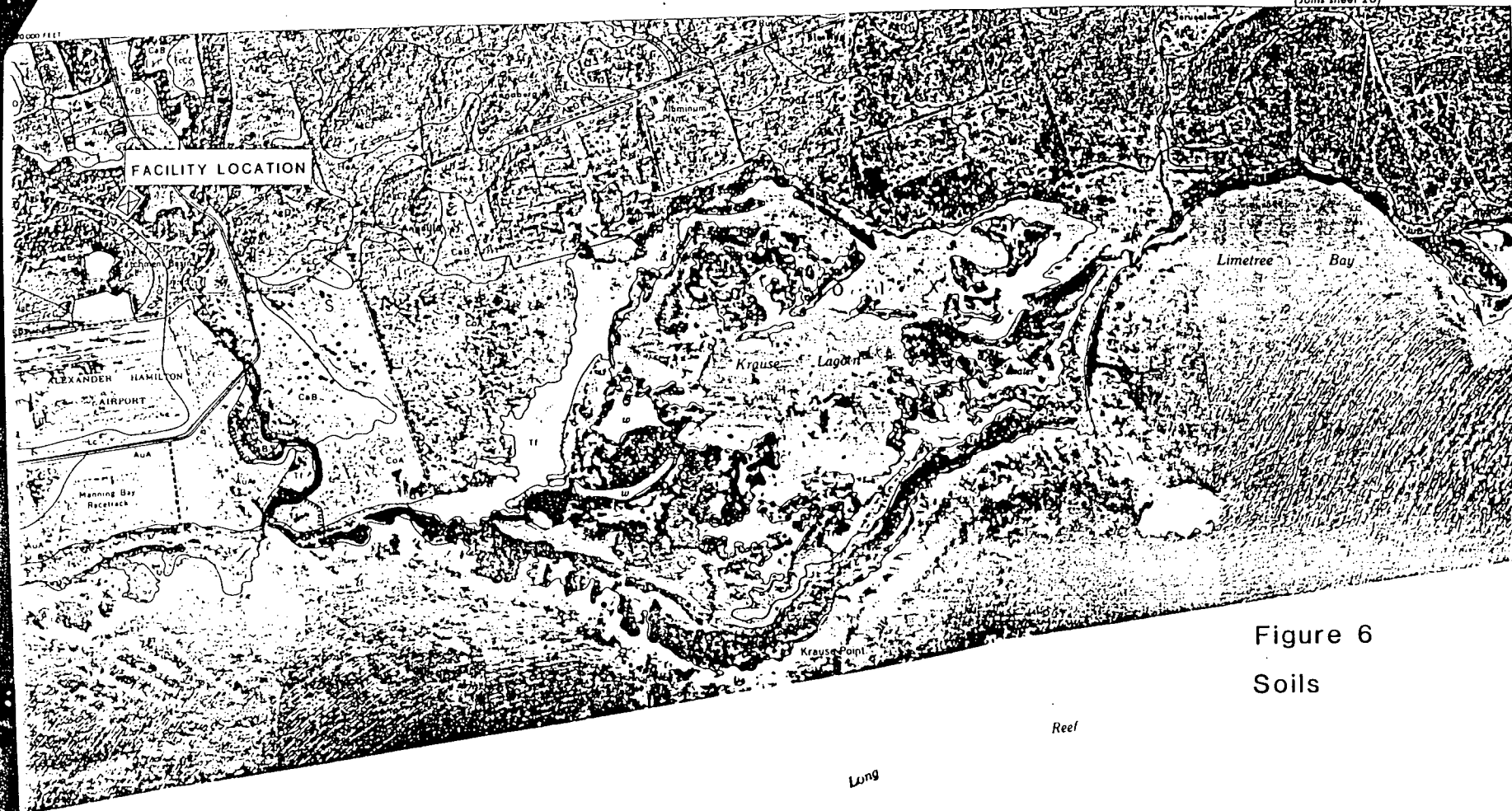
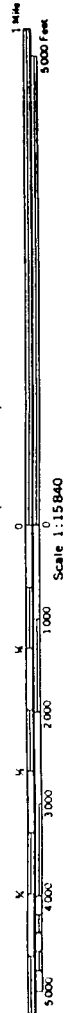


Figure 6
Soils

(Joins sheet 32)



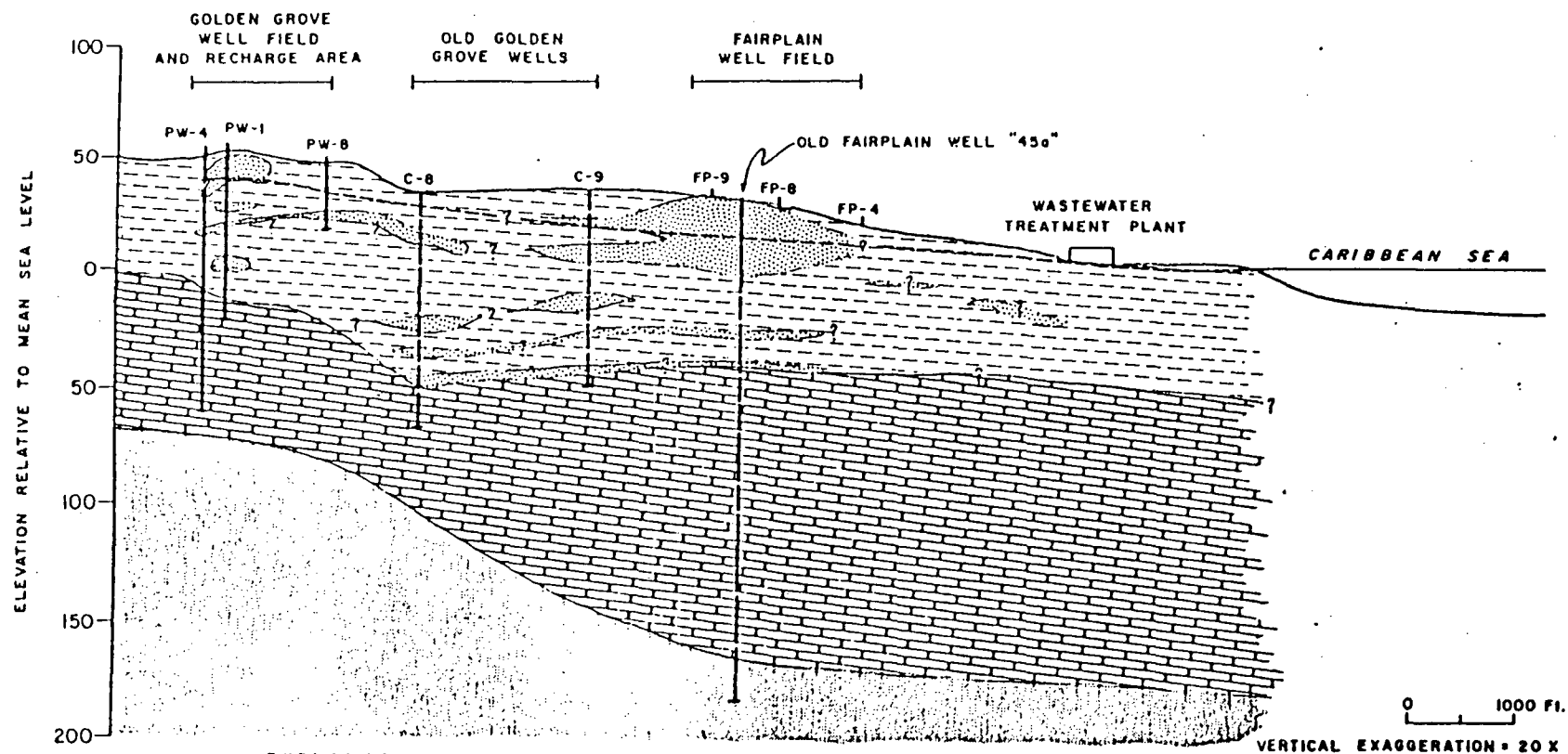
100391

C A R I B B E A N S E A

SOURCE: SOIL SURVEY: VIRGIN ISLANDS
OF THE UNITED STATES, 1970.
USDA - SCS.

Original maps based on Puerto Rico compass
system. Puerto Rico, St. John, and Lament compass
and projection. 1940 adjustment Puerto Rico system.

1:100,000 FEET



SUBJECT			
SCHEMATIC			
HYDROGEOLOGIC CROSS-SECTION			
PARALLEL TO AXIS OF LOWER RIVER GUT			
PREPARED FOR			
GOVERNMENT OF U.S. VIRGIN ISLANDS-- CONSERVATION AND CULTURAL AFFAIRS			
Geraghty & Miller, Inc.	COMPLETED BY	Daniel A. Nachman	SCALE
	PREPARED BY	Geoffrey Schaffner	Shown
	PROJECT MGR	William Bois	DATE
		9-82	FIGURE 7

Source: Geraghty & Miller, 1983

Figure 7

WELL FIELD LOCATIONS

0 2,000 FEET



PROSPERITY WELL FIELD



La GRANGE WELL FIELD

Fredericksted

ADVENTURE WELL FIELD



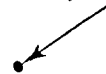
GOLDEN GROVE WELL FIELD



NEGRO BAY WELL FIELD



FAÇILITY LOCATION



FAIR PLAINS WELL FIELD



CONCORDIA WELL FIELD



BARREN SPOT
WELL FIELD

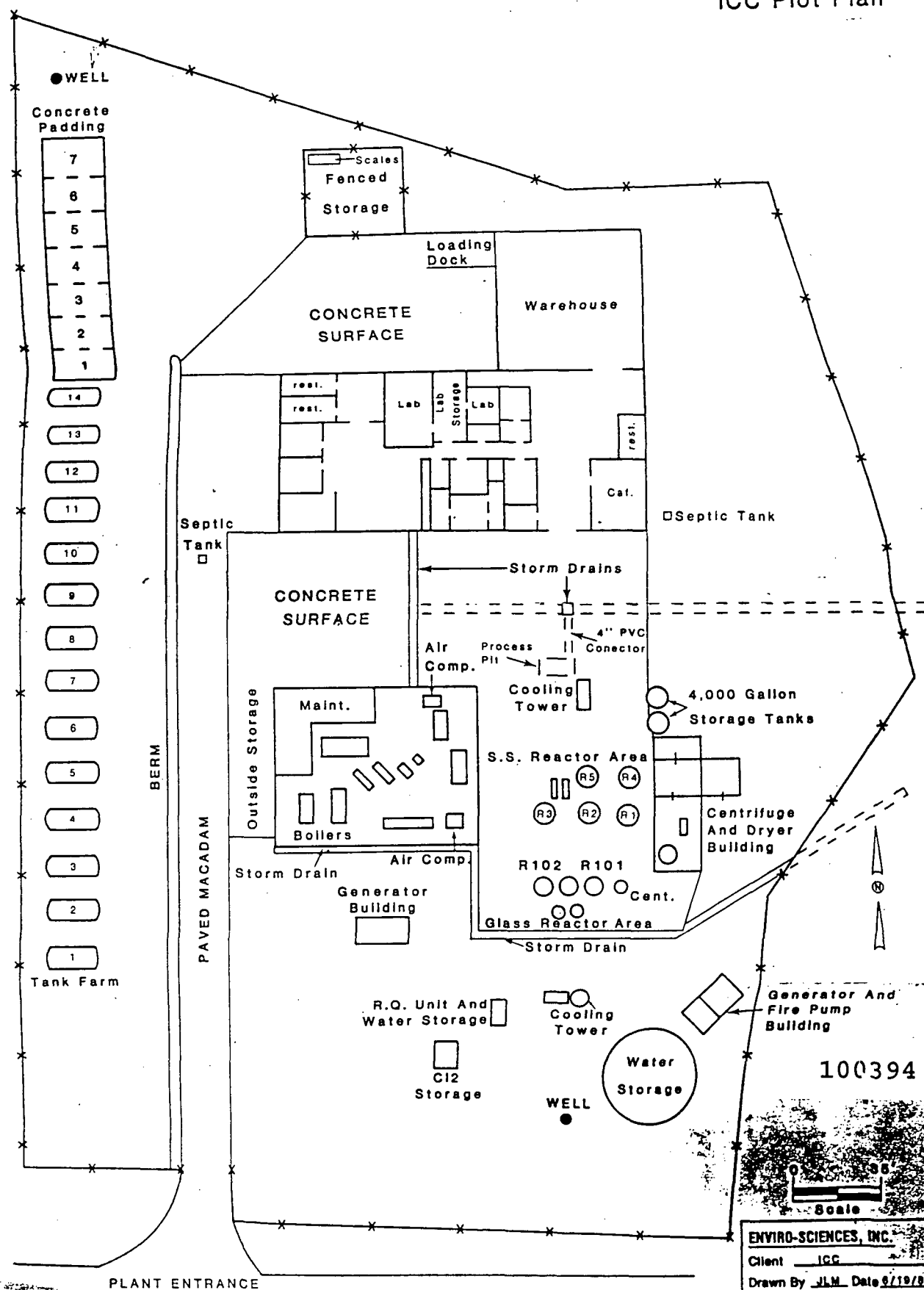


SOURCE: COMPREHENSIVE WATER RESOURCES MANAGEMENT
PLAN FOR THE U.S. VIRGIN ISLANDS 1983.

100393

Figure 3

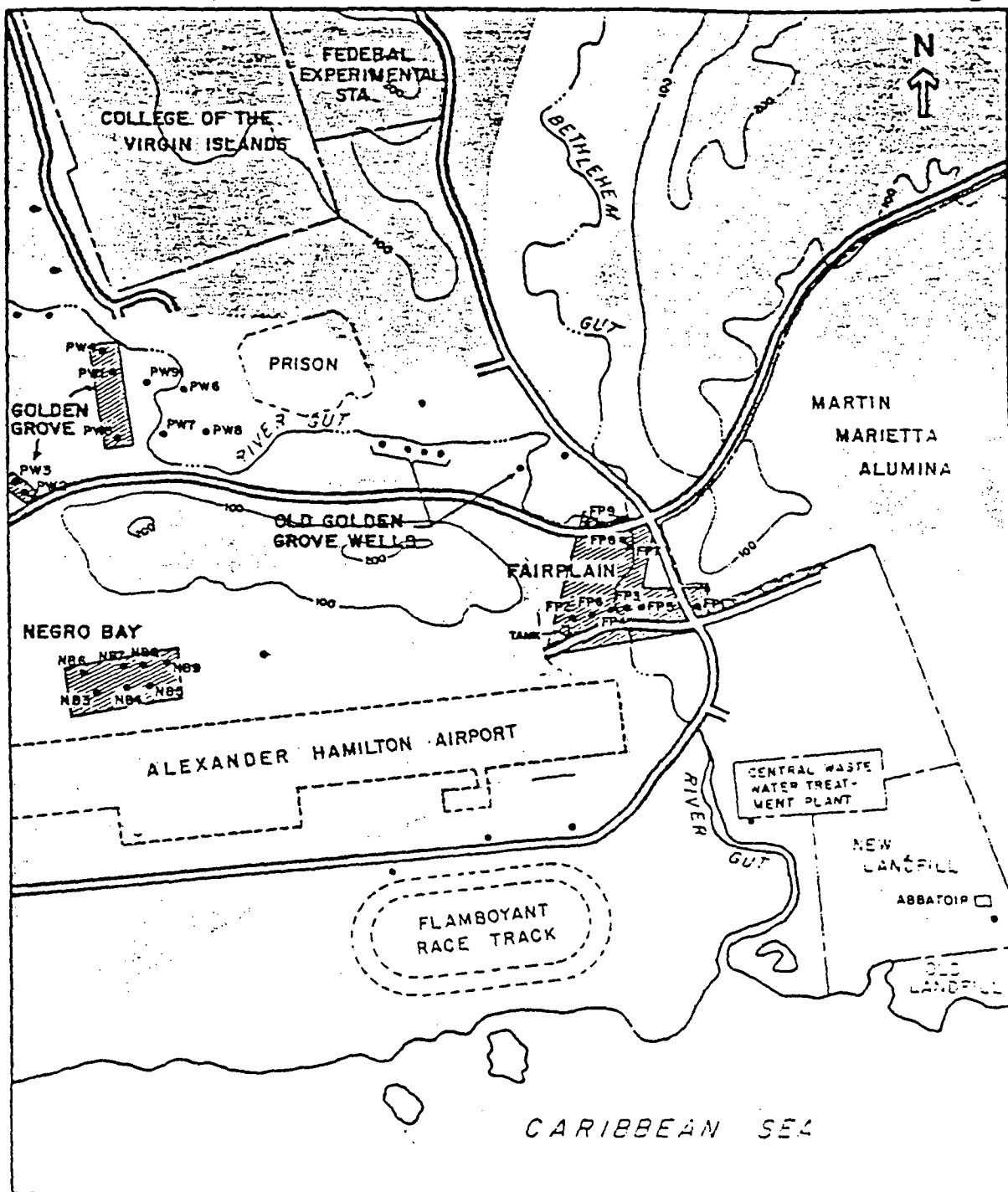
ICC Plot Plan



100394

ENVIRO-SCIENCES, INC.
 Client ICC
 Drawn By JLM Date 9/19/88
 Revised By JLM Date 7/1/89
 Scale 1" = 35' (Original)

Figure 8



EXPLANATION

- ROAD
 - INTERMITTENT STREAM
 - PROPERTY BOUNDARY
 - WELL LOCATION
 - WELL NUMBER
 - PUBLIC-SUPPLY WELL FIELD
 - ALLUVIUM-FILLED VALLEY & COASTAL PLAIN
 - OUTCROP OF KINGSHILL LIMESTONE
- 0 500 ft.

SUBJECT

GEOLOGY AND LOCATION OF
WELLS IN FAIRPLAIN WELL FIELD AREA,
ST. CROIX

PREPARED FOR

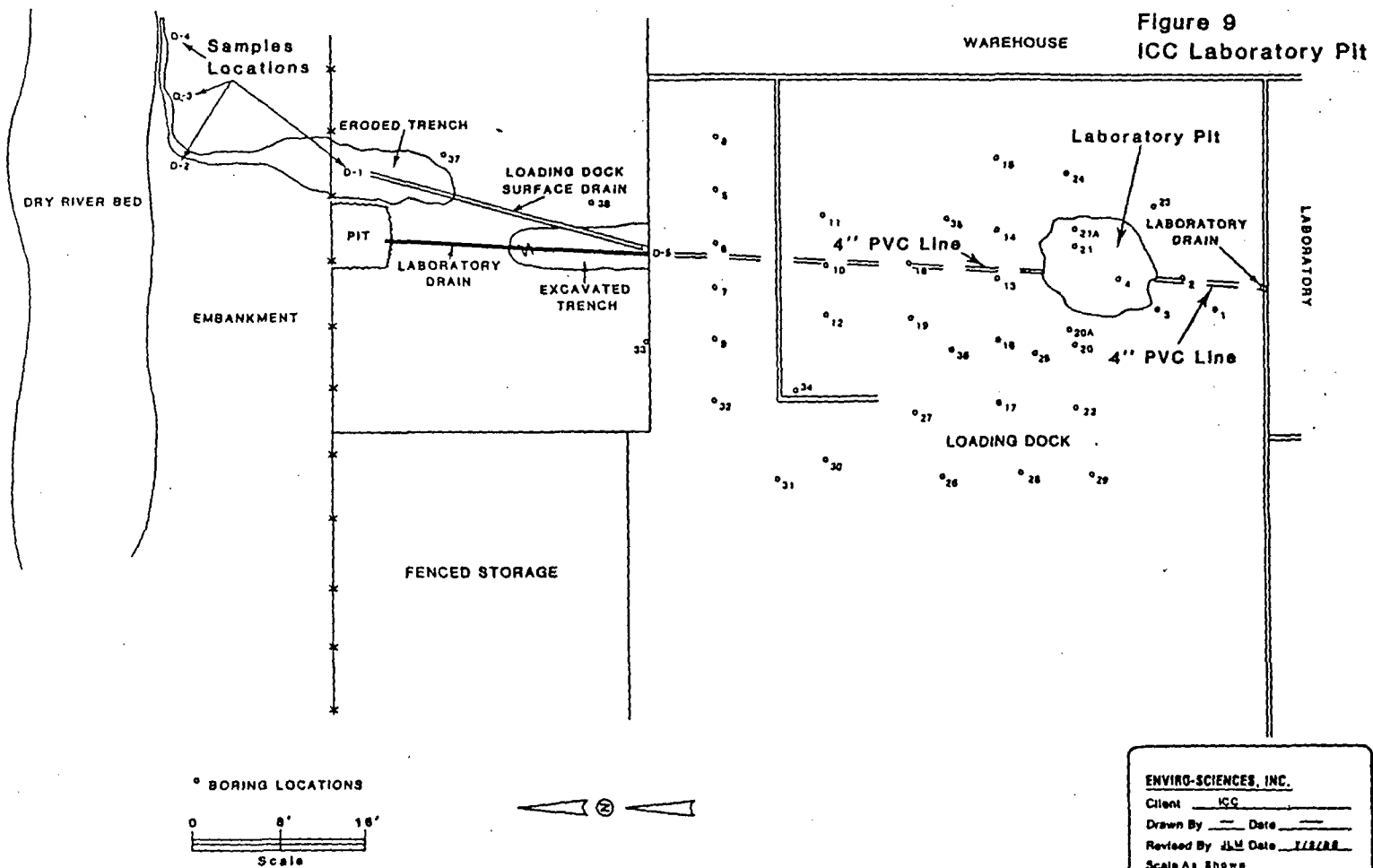
GOVERNMENT OF U.S. VIRGIN ISLANDS--
CONSERVATION AND CULTURAL AFFAIRS

Geraghty
& Miller, Inc.

COMPILED BY Daniel A. Nachman
PREPARED BY William H. Cicio
PROJECT MGR William Bois

SCALE Shown
DATE 2/83

FIGURE
5



100396

ICC Plot Plan: Trenches

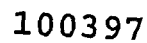
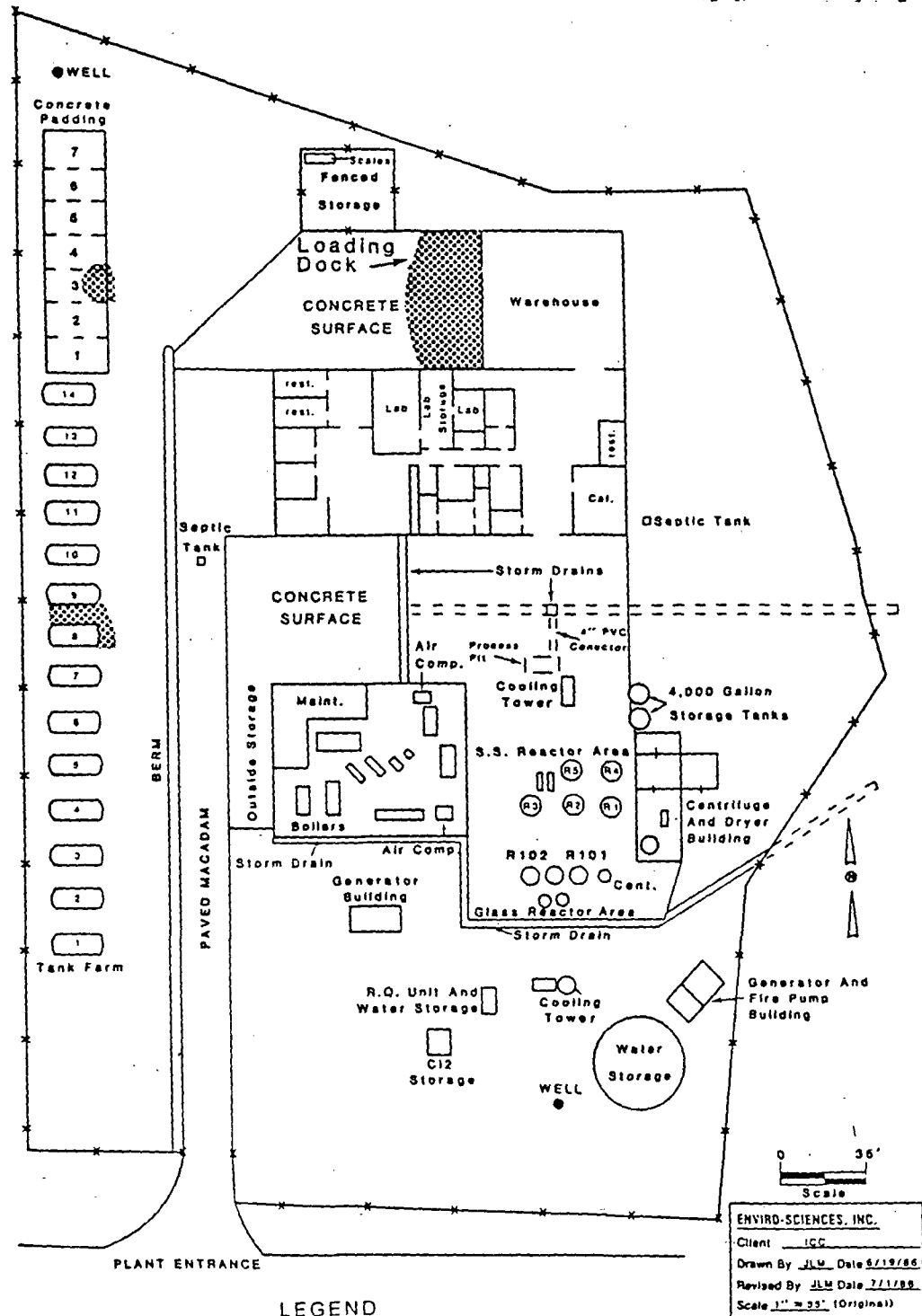


Figure 11

ICC Plot Plan: Areas Of Contamination



LEGEND



Areas of Contamination

Figure 12

Contamination At Slab 3

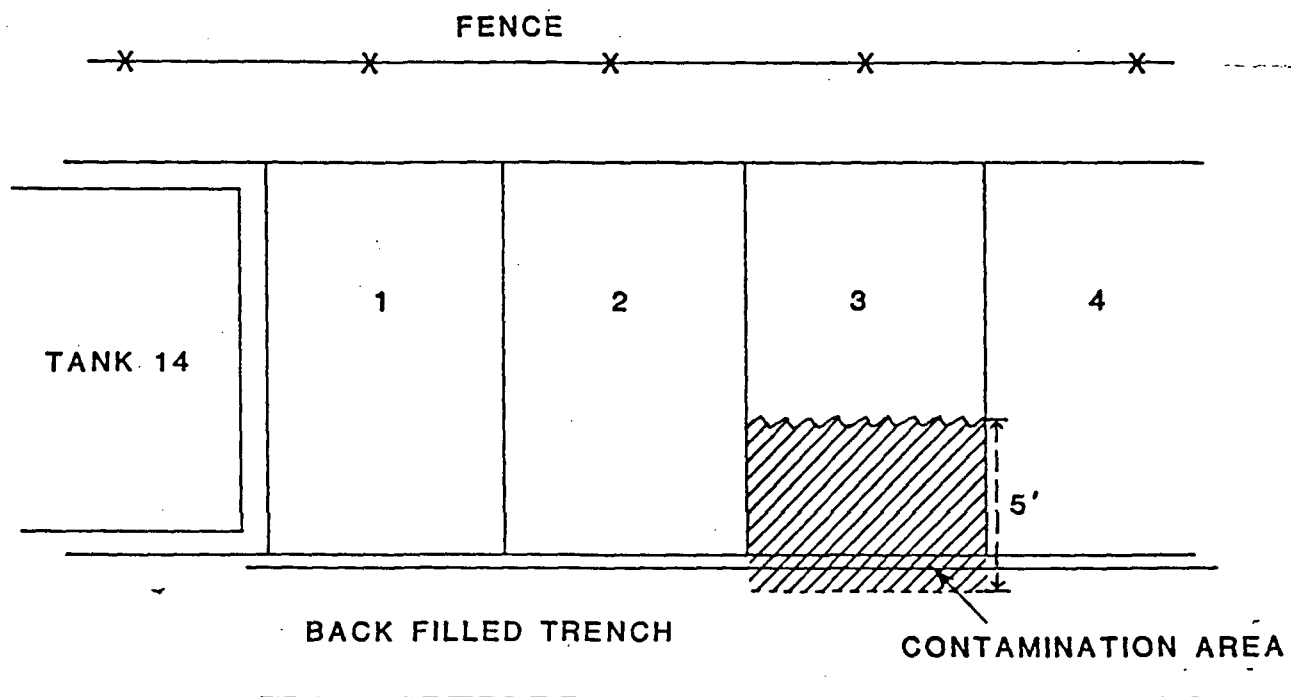
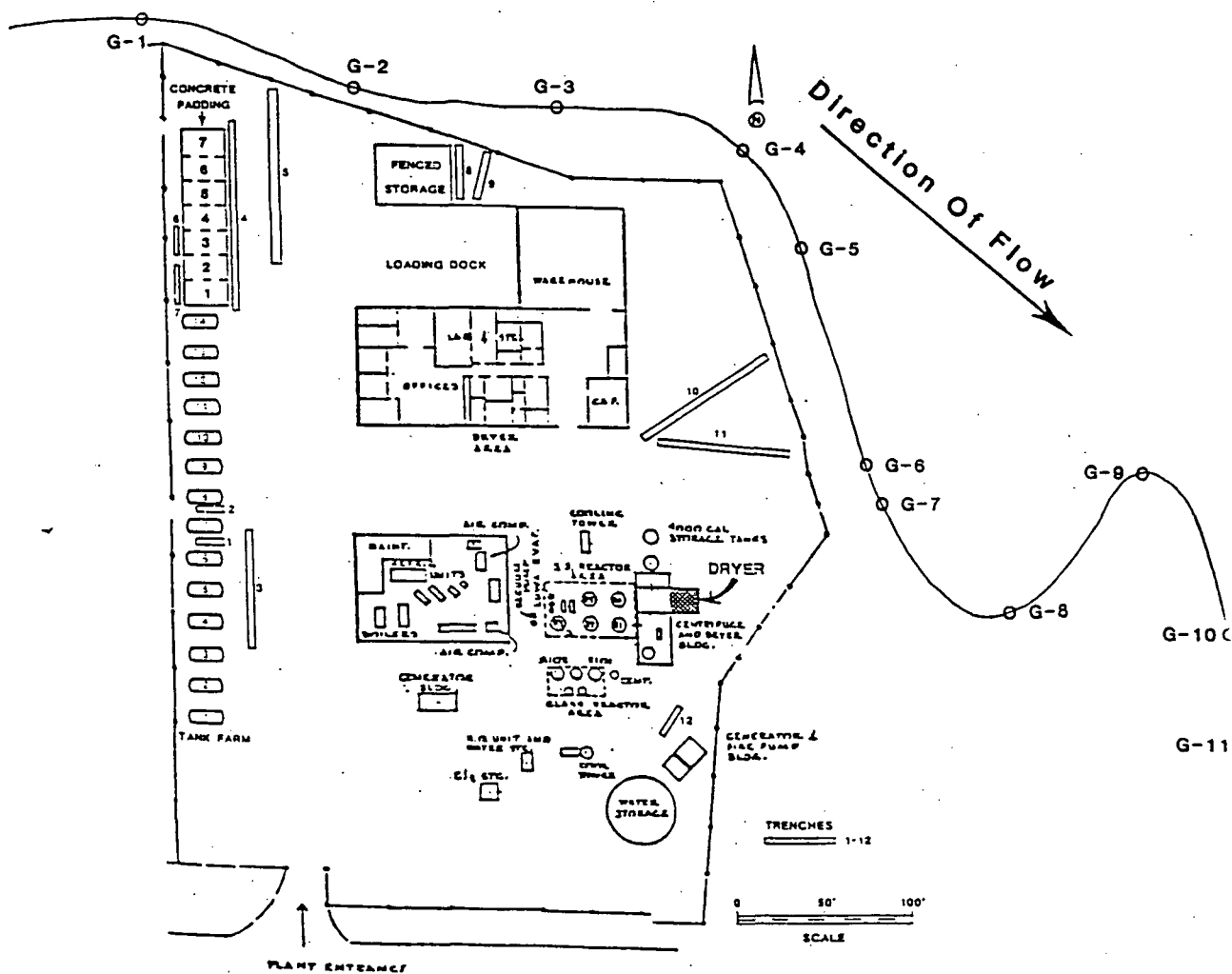


Figure 13

Gut Soil Sampling Program



100400

ENVIRO-SCIENCES, INC.

Client ICC

Drawn By — Date —

Revised By JLM Date 7/3/86

Scale As Shown

APPENDIX A

Soil Testing on ICC Site

Caribbean
Drilling
Services

INCORPORATED

Box 45 Kingshill St. Croix V.I. 00850 (809) 773-2737

General Engineering Corp.
P.O. Box 459
Christiansted, St. Croix

May 12, 1979
CDS Job #79512

ATTENTION: Mr. John McCallum

REFERENCE: Subsurface Investigation - Proposed Cooper Laboratories
Plant Expansion, Estate Bethlehem, St. Croix

Dear Sirs:

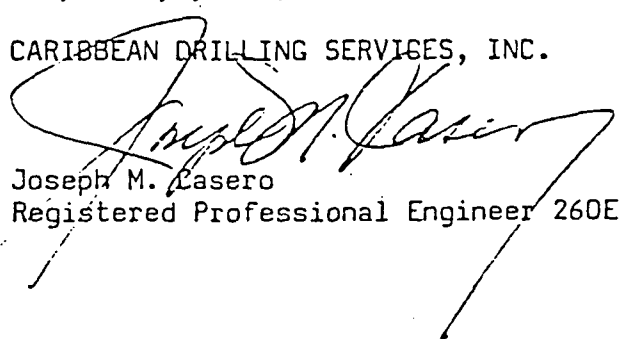
Enclosed herewith please find our soil engineering report
for the above project.

Based on the available soils information it appears that
footing foundations are feasible for the support of the proposed units.
Specific recommendations are included in the body of the report.

Should you have any questions with regard to this report,
please do not hesitate to contact us.

Very truly yours,

CARIBBEAN DRILLING SERVICES, INC.


Joseph M. Casero
Registered Professional Engineer 260E

JMC:fs

100402

SOIL REPORT
SUBSURFACE INVESTIGATION - PROPOSED COOPER
LABORATORIES PLANT EXPANSION, ESTATE BETHLEHEM
ST. CROIX, U.S.V.I.

100403

SOIL REPORT
SUBSURFACE INVESTIGATION - PROPOSED COOPER
LABORATORIES PLANT EXPANSION, ESTATE BETHLEHEM
ST. CROIX, U.S.V.I.

INTRODUCTION

The subsurface investigation for the proposed Cooper Laboratories Plant Expansion, Estate Bethlehem, St. Croix has been completed. Three (3) soil borings were performed at the site and the results of these borings, together with a location diagram are included in this report.

It is our understanding that the proposed expansion will occupy an area of 33 ft. by 17 ft. with various units including a large glass reactor having an estimated total weight (including internals) of 35 tons. Other units will have minor loads.

The purpose of this report is to describe the soil conditions as encountered in the borings, to analyze and evaluate the boring and test data obtained, and to submit recommendations regarding feasible foundation design and construction.

SUBSURFACE INVESTIGATION PROCEDURES

The soil borings were performed using a trailer-mounted drilling rig equipped with a hydraulic head used in the drilling and sampling operations. Also used was a truck mounted rig for deeper holes. The boreholes were advanced using continuous flight hollowstem augers and representative samples were obtained by means of split-barrel sampling procedures in accor-

100404

dance with ASTM Specifications D-1586.

In the split-barrel sampling procedure, standard penetration resistance values (blows per foot of a 140 lb. hammer falling 30" on a 2" O.D. split-barrel sampler) were obtained. These resistance values are an indication of the relative density of predominantly granular soil in place.

All soil samples obtained in the field were labeled, sealed and forwarded to the laboratory for further examination and testing.

TESTING PROGRAM

Due to the nature of the soils encountered a limited laboratory testing program was implemented.. The program consisted of reclassification of the samples and determination of the natural moisture content. The results of all tests performed are shown on the boring logs opposite the corresponding samples.

Careful boring logs were kept in the field, where the soil samples were classified in accordance with the Unified Soil Classification System. After completion of the testing program, the samples were again examined and the field classifications revised where necessary.

SOIL CONDITIONS

The site is located in an alluvium valley formed on the Kings-hill Formation of Lower Miocene Age. Sediments were derived from the north range and consist of fine sands, sandy clays and silty gravels. Variable stratification is present indicating braided stream deposition.

100405

From a soils engineering viewpoint, the upper surface soils (below existing concrete slab at B-1 and B-2) at all boring locations consist of either stiff silty clay or silty sand with variable percentages of clay to an average depth of from 1.5 to 2.5 ft. Below this surface layer, medium dense to dense silty sand and gravel or sandy silt (B-1) strata were encountered which extended to depth of from 5.0 to 7.5 ft., merging gradually into sandy silt or silty sand with numerous rock fragments. This latter stratum was interspersed with sandy clay seams of limited thickness.

The lowest soil formation encountered (typically below 15 ft.) was a medium dense to very dense silty sand and gravel which extended to the maximum depths investigated (i.e. 25 ft.).

WATER TABLE CONDITIONS

Water level observations made after boring are shown on the boring logs. Based on the available information it appears that at the time the borings were performed, the hydrostatic water table was at approximately 20 ft. below the present ground surface at all boring locations.

The hydrostatic water table should be anticipated to fluctuate throughout the year depending upon variations in precipitation and surface runoff.

100406

ANALYSIS AND RECOMMENDATIONS

As described under soil conditions, the upper, near surface soils, consisting primarily of silty clay or loose silty sand and are not considered competent soils.

We recommend footing type foundations be used deriving their support from either the medium dense silty sand and gravel or sandy silt typically encountered at 3 ft. below present ground surface.

Footings may be designed for a maximum allowable total load soil bearing pressure of 3000 p.s.f., when established on the bearing soils noted above. If higher allowables are required, footings should be established below 5 ft., at which depth an allowable total load soil bearing pressure of 4000 p.s.f. or higher may be used.

For footings located on the medium dense silty sand or sandy silt at 3.0 ft. (min.) below present ground surface, anticipated settlements should not exceed $\frac{1}{2}$ ". Differential settlements, however, should be negligible.

Due to the nature of the bearing soils, (particularly at the location of boring B-1) we strongly recommend that excavations not be left open for an extended period of time. Saturation of the sandy silt or fine grained sand will affect bearing capacity adversely. If saturation does occur, it is recommended that the soil (saturated) be removed to full disturbed depth prior to steel placement and pouring the concrete.

No construction problems are anticipated for the smaller

100407

units, but some sloughing of the semi-granular soils may occur in the excavations, which may not permit certain foundations to be poured neat. Again the longer excavations are left open the more sloughing is to be anticipated.

Site drainage should be given careful attention to insure that surface waters are not permitted to stand near or seep into the foundation bearing soils.

This report has been prepared in order to aid in the evaluation of the site soil parameters and to assist the engineer in the design of the project. The analysis and recommendations submitted in this report are based on data obtained from three (3) soil borings performed at the locations shown on the reference sketch 79512-D. This report does not reflect the variations between borings which may not become evident until the course of construction. If variations then appear evident, it will be necessary for the soil and foundation engineer to re-evaluate the recommendations of this report after performing on-site observations and noting the effect of such variations on the design of the structure.

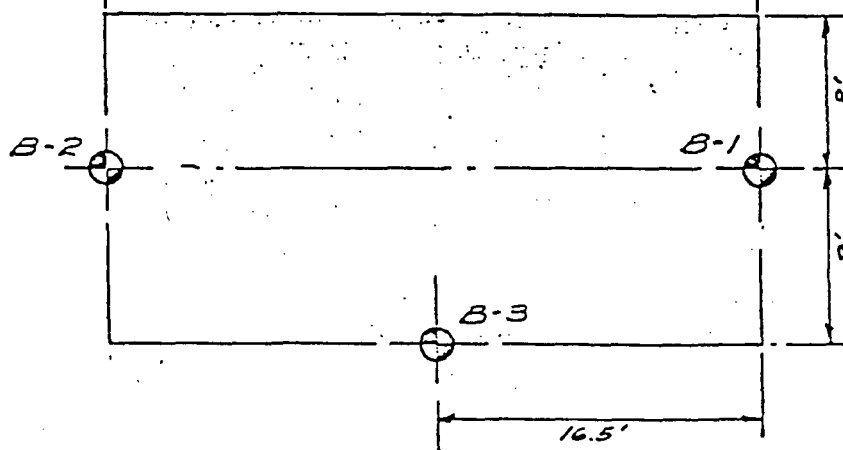
100408

SOIL BORING LOCATIONS

100409



EXISTING
PLANT



100410

SOIL BORING LOCATIONS
COOPER LABS PLANT EXPANSION
SCALE: 1" = 10' JP6 MAY 11 1979
79512-D

SOIL BORINGS

100411

OWNER COOPER LABS, INC.				LOG OF BORING NUMBER B-2			
PROJECT NAME PLANT EXPANSION				ARCHITECT-ENGINEER GENERAL ENGINEERING, INC.			
SITE LOCATION ESTATE BETHLEHEM							
ELEVATION DEPTH		SAMPLE NO.		SAMPLE TYPE		SAMPLE DISTANCE	
X						RECOVERY	
DESCRIPTION OF MATERIAL				UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²			
				1 2 3 4 5			
				PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT %			
				X --- O --- A			
				10 20 30 40 50			
				STANDARD PENETRATION BLOWS/FT.			
				10 20 30 40 50			
SURFACE ELEVATION				UNIT DRY WT. LBS./FT. ³			
6" CONCRETE SLAB							
trace clay to 3'							
SILTY SAND AND GRAVEL, Lt. Brown, Med. Dense to Dense							
(SM-GM)							
SANDY SILT W/WEATHERED ROCK FGMTS, Lt. Brown							
(ML)							
SANDY CLAY - SOME SILT, Lt. Brown, Very Tough to Hard							
(CL)							
SILTY SAND AND GRAVEL, Lt. Brown, Very Dense							
(SM-GM)							
Bottom of Boring							
				100412			
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU, THE TRANSITION MAY BE GRADUAL.							
WL		WS OR WD		BORING STARTED 4/18/79		CARIBBEAN DRILLING SERVICES, INC.	
WL		BCR ACR		BORING COMPLETED 4/18/79		SOIL AND FOUNDATION CONSULTANTS	
WL 19.5' - A.B.				RIG 45-C FOREMAN KDE		APPROVED BY JMC CDS JOB NO. 79512	

OWNER COOPER LABS, INC.					LOG OF BORING NUMBER B-3				
PROJECT NAME PLANT EXPANSION					ARCHITECT-ENGINEER GENERAL ENGINEERING, INC.				
SITE LOCATION ESTATE BETHLEHEM					UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5 PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT % 10 20 30 40 50 STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50				
ELEVATION	DEPTH	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE					
SURFACE ELEVATION						UNIT DRY WT. LBS./FT. ³			
X						SILTY CLAY - TRACE SAND, Lt. Brown, Med. Dense (CL)			
		1	SS			SILTY SAND AND GRAVEL, Lt. Brown, Med. Dense to Dense (GM-SM)			
		2	SS			SANDY SILT - TRACE CLAY, Lt. Brown, Very Dense (ML)			
		3	SS			SILTY SAND W/WEATHERED ROCK FGMTS, Lt. Brown, Med. Dense (GM-SM)			
		4	SS			SANDY CLAY, Lt. Brown, Tough (CL)			
		5	SS			SILTY SAND AND GRAVEL (WEATHERED ROCK FGMTS), Lt. Brown to Tan, Med. Dense to Dense (SM-GM)			
		6	SS			Bottom of Boring			
		7	SS			Bottom of Boring			

100413

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL	WS OR WD	BORING STARTED 4/17/79	CARIBBEAN DRILLING SERVICES, INC. SOIL AND FOUNDATION CONSULTANTS	
WL	BCR	AOR		BORING COMPLETED 4/17/79
WL 20.0' - A.B.				RIG 45-C FOREMAN KDE
			APPROVED BY JMC CDS JOB NO. 79512	

OWNER COOPER LABS, INC.					LOG OF BORING NUMBER B-1				
PROJECT NAME PLANT EXPANSION					ARCHITECT-ENGINEER GENERAL ENGINEERING, INC.				
SITE LOCATION ESTATE BETHLEHEM					UNCONFINED COMPRESSIVE STRENGTH TONE/FT.² 1 2 3 4 5 PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT % 10 20 30 40 50 STANDARD PENETRATION 10 20 30 40 50 BLOWS/FT. 10 20 30 40 50				
ELEVATION	DEPTH	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE					
SURFACE ELEVATION									
6" CONCRETE SLAB									
SILTY CLAY, Lt. Brown, Stiff (CL)									
SANDY SILT - TRACE CLAY, Lt. Brown, Med. Dense (ML)									
SILTY SAND AND GRAVEL, Lt. Brown, Dense (GM-SM)									
SANDY SILT W/WEATHERED ROCK FGMTS, Lt. Brown, Dense (ML-GM)									
SILTY SAND - TRACE TO SOME GRAVEL, Lt. Brown, Dense (SM)									
Bottom of Boring									

100414

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL 14.0'	WS OR WD	BORING STARTED 4/17/79	CARIBBEAN DRILLING SERVICES, INC. SOIL AND FOUNDATION CONSULTANTS
WL BCR	ACR	BORING COMPLETED 4/17/79	
WL 19.5' - A.B.	RIG 45-C	FOREMAN KDE	
			APPROVED BY JMD CDS JOB NO. 79512

OWNER COOPER LABS, INC.				LOG OF BORING NUMBER B-3																																																							
PROJECT NAME PLANT EXPANSION				ARCHITECT-ENGINEER GENERAL ENGINEERING, INC.																																																							
SITE LOCATION ESTATE BETHLEHEM																																																											
<table border="1"> <thead> <tr> <th>ELEVATION DEPTH</th> <th>SAMPLE NO.</th> <th>SAMPLE TYPE</th> <th>SAMPLE DISTANCE</th> <th>RECOVERY</th> <th>DESCRIPTION OF MATERIAL</th> <th>UNIT DRY WT. LBS./FT.³</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>SS</td> <td></td> <td></td> <td>SILTY CLAY - TRACE SAND, Lt. Brown, Med. Dense (CL)</td> <td></td> </tr> <tr> <td>5</td> <td>2</td> <td>SS</td> <td></td> <td></td> <td>SILTY SAND AND GRAVEL, Lt. Brown, Med. Dense to Dense (GM-SM)</td> <td></td> </tr> <tr> <td>10</td> <td>3</td> <td>SS</td> <td></td> <td></td> <td>SANDY SILT - TRACE CLAY, Lt. Brown, Very Dense (ML)</td> <td></td> </tr> <tr> <td>15</td> <td>4</td> <td>SS</td> <td></td> <td></td> <td>SILTY SAND W/WEATHERED ROCK FGMTS, Lt. Brown, Med. Dense (GM-SM)</td> <td></td> </tr> <tr> <td>20</td> <td>5</td> <td>SS</td> <td></td> <td></td> <td>SANDY CLAY, Lt. Brown, Tough (CL)</td> <td></td> </tr> <tr> <td>25</td> <td>6</td> <td>SS</td> <td></td> <td></td> <td>SILTY SAND AND GRAVEL (WEATHERED ROCK FGMTS), Lt. Brown to Tan, Med. Dense to Dense (SM-GM)</td> <td></td> </tr> <tr> <td colspan="6">Bottom of Boring</td> <td></td> </tr> </tbody> </table>								ELEVATION DEPTH	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	1	1	SS			SILTY CLAY - TRACE SAND, Lt. Brown, Med. Dense (CL)		5	2	SS			SILTY SAND AND GRAVEL, Lt. Brown, Med. Dense to Dense (GM-SM)		10	3	SS			SANDY SILT - TRACE CLAY, Lt. Brown, Very Dense (ML)		15	4	SS			SILTY SAND W/WEATHERED ROCK FGMTS, Lt. Brown, Med. Dense (GM-SM)		20	5	SS			SANDY CLAY, Lt. Brown, Tough (CL)		25	6	SS			SILTY SAND AND GRAVEL (WEATHERED ROCK FGMTS), Lt. Brown to Tan, Med. Dense to Dense (SM-GM)		Bottom of Boring		
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10	3	SS			SANDY SILT - TRACE CLAY, Lt. Brown, Very Dense (ML)																																																						
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WL 20.0' - A.B.				RIG 45-C FOREMAN KDE																																																							

**Caribbean
Drilling
Services**
INCORPORATED

Engineering Analysis & Reports — Construction Quality Control — Inspection — Testing — Design

Address Reply To:

P.O. BOX 45, KINGSHILL
ST. CROIX, U.S. VIRGIN ISL. 00850

Cooper Laboratories Inc.
Frederiksted, St. Croix
U.S. Virgin Islands

Reference: Subsurface Investigation
Proposed Firewater Tank
Cooper Laboratories Plant
Frederiksted, St. Croix

August 19, 1980
CDS Job No. 81501

Dear Sirs:

We are submitting herewith, our engineering report on the subsurface investigation for the above project.

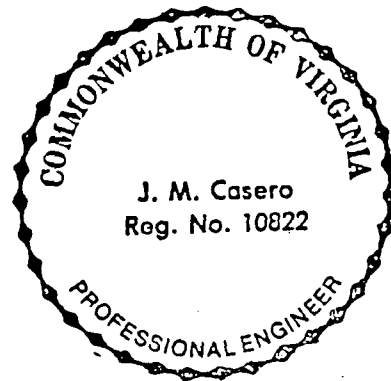
Based on the information obtained from the soil borings and laboratory test data, it appears that adequate support for the proposed tank may be obtained within a reasonable depth at the proposed site. Specific recommendations are discussed in detail in the body of the report.

Should you have any questions with regard to this report, please do not hesitate to contact us.

Very truly yours,
CARIBBEAN DRILLING SERVICES, INC.

Joseph M. Casero
Joseph M. Casero
Registered Professional Engineer

JMC/sc



100416

SUBSURFACE INVESTIGATION

PROPOSED FIREWATER TANK

COOPER LABORATORIES PLANT

FREDERIKSTED, ST. CROIX

U.S. VIRGIN ISLANDS

100417

SOIL REPORT

SUBSURFACE INVESTIGATION FOR THE PROPOSED FIREWATER TANK COOPER LABORATORIES PLANT, FREDERIKSTED, ST. CROIX, U.S.V.I.

CDS Job No. 81501
August 19, 1980

INTRODUCTION

The subsurface investigation for the Proposed Firewater Tank to be located at the Cooper Laboratories Plant in Frederiksted, St. Croix, U.S. Virgin Islands, has been completed. A total of three (3) soil borings were performed and the results of these borings together with a location diagram are included with this report.

It is our understanding that the Proposed Tank will be approximately 37.0 ft. in diameter and approximately 38.0 ft. high. The tank is contemplated as a Firewater Reserve and is designed with a tank ring on a compacted and treated fill. Foundation requirements stipulate a bearing capacity of approximately 2,000 psf with minimal settlement. Finished grade has not been established at this time but is expected to be slightly higher than existing plant grade, for ease in piping.

The purpose of this report is to describe the soil conditions as encountered in the borings, to analyze the field and laboratory data and to submit recommendations regarding feasible foundation depths for the project requirements.

SUBSURFACE INVESTIGATION PROCEDURES

The soil borings were performed with a trailer-mounted drilling rig equipped with a hydraulic head used in the drilling and sampling operations. The boreholes were advanced using continuous flight augers and

100418

representative samples were obtained by means of split-barrel samplers in accordance with ASTM Specification D-1586.

In the split-barrel sampling procedure, standard penetration resistance values (blows per foot of a 140 lb. hammer falling 30 in. on a 2 in. O.D. split-barrel sampler were obtained). These resistance values (SPT) are an indication of the relative density of the soils in place.

All soil samples obtained in the field were sealed and forwarded to the laboratory for further examination and testing.

LABORATORY TESTING PROGRAM

Due to the nature of the soils encountered, a limited laboratory testing program was implemented. The samples were carefully examined and re-classified and the natural moisture content of representative portions was determined. The results of all laboratory tests are plotted graphically opposite the corresponding samples on the boring logs.

Careful boring logs were kept in the field where the soil samples were classified in accordance with the Unified Soil Classification System (USCS). At the completion of the testing program, the samples were again examined and the field classifications revised, where necessary.

SOIL CONDITIONS

The specific soil conditions at each boring location are detailed on the pertinent boring log. Typically, a medium dense brown sandy silt, approximately 2.0 ft. in total thickness, blankets the site. This stratum is in a loose to medium dense state.

Below this surface veneer, medium dense light brown clayey silts or sandy clayey silts were encountered which extended to depths ranging from 5.0 ft. at boring B-3, to a maximum of 8.0 ft. at boring B-2.

The clayey silts in turn are underlain by tough to very tough silty sandy clays which continue to the bottom of the boring B-1, and to approximately 12.0 ft. in boring B-3. Silty clays are absent in boring B-2 and the clayey silts previously mentioned extend to approximately 13.0 ft.

The lowest soil formation at borings B-2 and B-3, was a dense silty sand with varying percentages of gravel which continued to the maximum depth investigated (15.0 ft.).

Typically, below the surface veneer, density and strength increase with depth and moisture content decreases significantly below 7.0 ft.

WATER TABLE CONDITIONS

Water level observations made after boring are shown on the boring logs. Based on the available information, it appears that the hydrostatic water table was below the maximum depths investigated.

The hydrostatic water table should be anticipated to fluctuate throughout the year depending upon variations in precipitation and surface runoff.

Due to the possibility of occasional silty sand seams or gravel seams within the various formations, a perched water table may occur at the site during certain parts of the year. This condition would become evident during the time of construction.

ANALYSIS AND RECOMMENDATIONS

Based on an analysis of the soil profile and the results of the laboratory tests, we recommend that the site be excavated to approximately el. 102, and the footing for the tank ring be excavated further to el. 101. For footings so located, we recommend an allowable total load soil bearing pressure of 2,000 psf.

Anticipated settlement for this load criteria should not exceed $\frac{1}{2}$ ". Differential settlements are not expected to exceed $\frac{1}{4}$ ". For the interior of the tank we recommend select backfill, preferably quarry screenings, between el. 102 and el. 103.5, be used. All backfill should be placed in 8 in. lifts (loose thickness) and compacted to a minimum of 95% of the maximum density as determined by ASTM Specification D-1557.

We also recommend that the upper 6 in. consist of either oiled salt free sand or preferably oiled quarry screenings to preserve the integrity of the tank bottom steel (i.e. reduce moisture migration and oxidation to the bottom plates).

GENERAL RECOMMENDATIONS

It should be noted that the proposed bearing soils are moisture sensitive. We therefore recommend that excavations not be left open for any extended period to minimize the possibility of saturation or overdrying.

If saturation of the bearing soils should occur, it will be necessary to remove the disturbed soil to full depth prior to pouring the concrete or backfilling within the tank ring. This precaution is necessary in order to prevent unduly high differential settlements upon imposition of load.

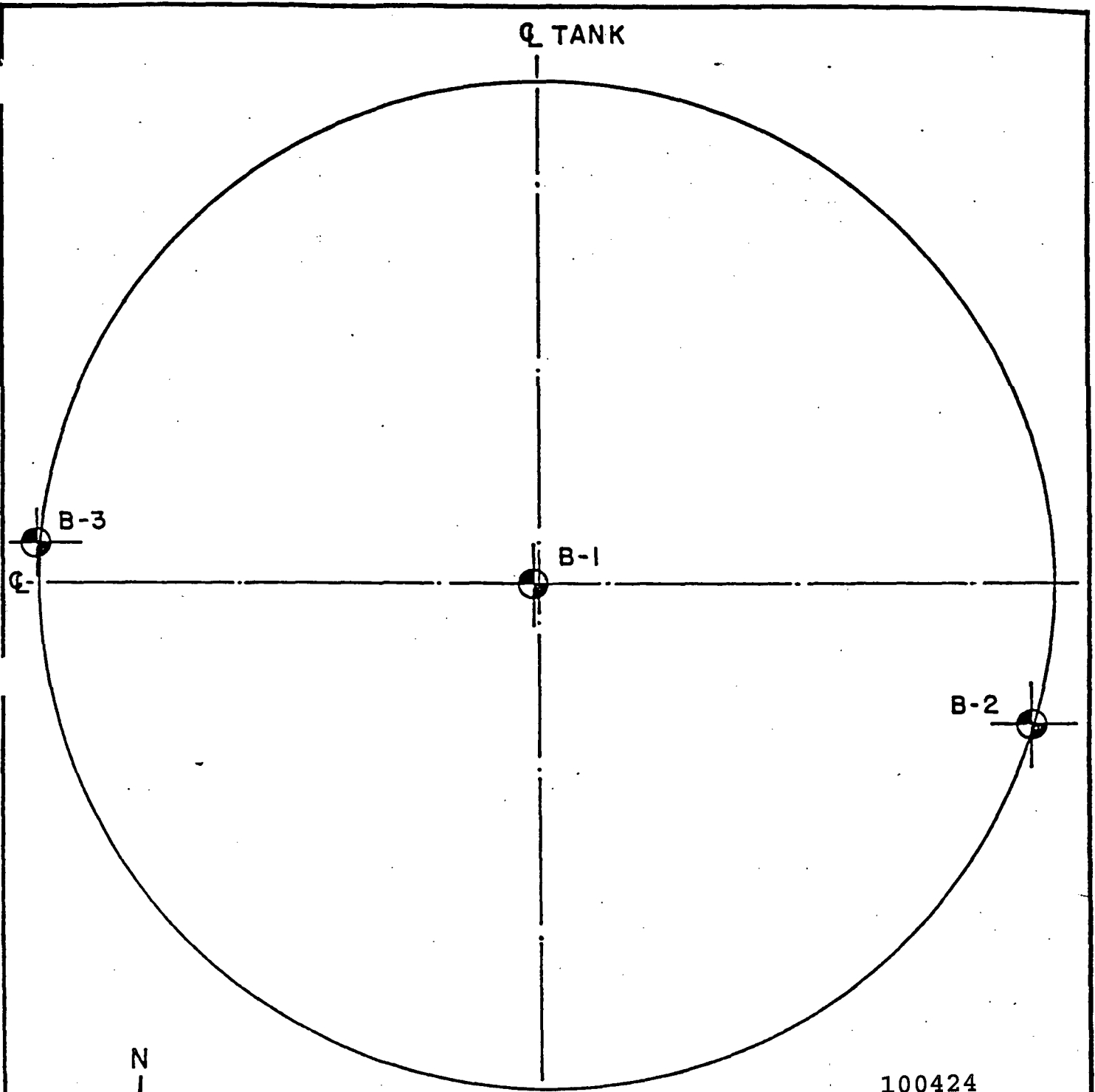
Due to the presence of silty clays and clayey silts relatively close to the bottom of the foundation system, it is imperative that moisture migration to the foundation elements be minimized. This may be accomplished by sloping the site away from the tank in all directions. Further, we suggest paving an annulus around the tank ring with asphaltic concrete so that sheetwash from the tank sides will not penetrate the ring foundations or create erosion gullies. A 10.0 ft. annulus should be adequate. Needless to say, positive drainage away from the tank pad area to avoid local ponding is absolutely essential.

Additionally, we recommend that the excavation and backfill operations be inspected by a qualified soil technician to verify that the proper bearing soil has been reached and to insure that the compaction requirements are met. The technician should perform in-situ density tests and the necessary proctor tests to establish compliance with these specifications.

This report has been prepared in order to aid in the evaluation of the foundation soil parameters of this site and to assist in the design of this project. In the event that any changes in the design or location of the tank pad, as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or approved in writing by the soil and foundation engineer.

SOIL BORINGS

100423



100424

SOIL BORING LOCATIONS		
PROPOSED FIREWATER TANK	SCALE	DRAWN BY
	3/16" = 1'-0"	GPC
		REVISED
CARIBBEAN DRILLING SERVICES INC.		
DATE	APPROVED BY	DRAWING NUMBER
8-18-80	JMC	81501-D

SOIL BORING LOCATIONS

100425

OWNER COOPER LABORATORIES					LOG OF BORING NUMBER B-1				
PROJECT NAME PROPOSED FIREWATER TANK					ARCHITECT-ENGINEER				
SITE LOCATION FREDERIKSTED, ST. CROIX, U.S.V.I.					UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5 PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT % 10 20 30 40 50 STANDARD PENETRATION 10 20 30 40 50 BLOWS/FT. 10 20 30 40 50				
ELEVATION	DEPTH	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE					
SURFACE ELEVATION 108.7									
1 SS See Note #1									
2 PA SANDY CLAYEY SILT, Light Brown to Brown, Medium Dense (ML-CL)									
3 SS SANDY SILTY CLAY, Light Brown to Brown, Tough to very Tough (CL)									
4 PA SANDY SILTY CLAY, Light Brown to Brown, Tough to very Tough (CL)									
Bottom of Boring						100426			
Note #1: SANDY SILT W/ LIMESTONE FRAGMENTS, Brown to Dark Brown, Medium Dense (ML)									
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.									
WL		WS OR WD		BORING STARTED 7/21/80		CARIBBEAN DRILLING SERVICES, INC. SOIL AND FOUNDATION CONSULTANTS			
WL		BCR		BORING COMPLETED 7/21/80					
WL		NONE - A.B.		RIG45-C FOREMAN KDE					
APPROVED BY JMC						CDS JOB NO. 81501			

OWNER					LOG OF BORING NUMBER							
COOPER LABORATORIES					B-2							
PROJECT NAME					ARCHITECT-ENGINEER							
PROPOSED FIREWATER TANK												
SITE LOCATION												
FREDERIKSTED, ST. CROIX, U.S.V.I.												
ELEVATION	DEPTH	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %	STANDARD PENETRATION BLOWS/FT.
X						SURFACE ELEVATION 107.7						
		1	SS			SANDY SILT, Brown to Dark Brown, Medium Dense (ML)						
			PA									
		2	SS			SANDY CLAYEY SILT, Light Brown, Medium Dense (ML-CL)						
			PA									
		3	SS			trace gravel						
			PA									
		4	SS			CLAYEY SILT W/ LIMESTONE FRAGMENTS, Brown, Dense (ML-CL)						
			PA									
		5	SS			SILTY SAND & GRAVEL, Brown, Dense (SM-GM)						
						Bottom of Boring						

100427

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

WL	WS OR WD	BORING STARTED 7/21/80	CARIBBEAN DRILLING SERVICES, INC.
WL	BCR	ACR	SOIL AND FOUNDATION CONSULTANTS
WL	NONE- A.B.	RIG45-C FOREMAN KDE	APPROVED BY JMC CDS JOB NO. 81501

OWNER COOPER LABORATORIES					LOG OF BORING NUMBER B-3				
PROJECT NAME PROPOSED FIREWATER TANK					ARCHITECT-ENGINEER				
SITE LOCATION FREDERIKSTED, ST. CROIX, U.S.V.I.									
ELEVATION DEPTH		SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ² 1 2 3 4 5 PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT % STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50	
X						SURFACE ELEVATION 110.5			
1		1	SS			SANDY SILT W/ LIMESTONE FGMTS, Dark Brown, Medium Dense (ML)			
2		2	SS			CLAYEY SILT - SOME SAND, Brown, Medium Dense (ML-CL)			
3		3	SS			SILTY SANDY CLAY, Light Brown to Brown, Tough to very Tough (CL)			
4		4	SS						
5		5	SS			SILTY SAND - SOME GRAVEL, Brown, Dense (SM-GM)			
Bottom of Boring									
								100428	
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.									
WL	WS OR WD	BORING STARTED		7/21/80		CARIBBEAN DRILLING SERVICES, INC. SOIL AND FOUNDATION CONSULTANTS			
WL	BCR	ACR	BORING COMPLETED		7/21/80				
WL	NONE - A.B.		RIG 45-C	FOREMAN KDE					

REFERENCE NO. 3

100429

☒ Generator

☐ Transporter

☒ TSD

RCRA Enforcement

Berlex Laboratories, (a subsidiary of
Island Chemical Co., Inc.)
St. Croix, Virgin Islands

VID80651095

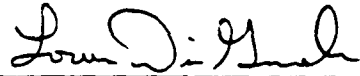
September 9, 1985

Participating Personnel:

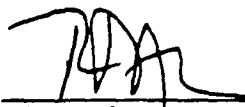
U.S. Environmental Protection Agency
Louis DiGuardia, Geologist
Carol Price, Environmental Scientist
Darvene Adams, Environmental Scientist

Berlex Laboratories, (ICC)
Alec A. Smith, Vice President of Operations
Raymond Hays
Armando Morales, Process Engineer

Report Prepared by:


Louis DiGuardia, Geologist
Source Monitoring Section

Approved for the Director by:


Richard D. Spear, Chief
Surveillance & Monitoring Branch

100430

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SUMMARY

Objective

This compliance evaluation and sampling inspection was conducted at the request of the Solid Waste Branch to support and verify the decontamination and removal by Berlex (ICC), St. Croix, VI of soil contaminated with toluene and pyridine.

Findings

1) Sampling results indicate:

- ° Organic analysis on samples #087001 and #087002 (drying oven) detected the following organic compounds ranging in values from 460 ppb to 15000000 ppb: toluene, flourene, bis(2-ethylhexyl) phthalate, benzophenone and di-n-octyl phthalate (detected only in sample #087002).

- ° Organics analysis on samples #087003, #087004, #087005, and #087006 (lab waste drainage area) detected the following organic compounds ranging in values from 360 ppb to 75,000 ppb: toluene, bis(2-ethylhexyl) phthalate, di-n-octyl phthalate, chloroform, benzene and di-n-butyl phthalate.

From the results, the toluene values were found to be within the acceptable level range of 2 ppm (reference document #2). Due to the late arrival of guidance protocol from EPA Research Laboratories, Cincinnati, no analysis of pyridine was performed.

2) Confirmation of on-site treatment of soil by Berlex (ICC) for toluene and pyridine was made.

- ° Toluene

The drying oven was employed for the volatilization of toluene from the soil, but the necessary charcoal filters to absorb the volatilized material were not observed.

- ° Pyridine

The contaminated soil was tilled and aerated using a backhoe and then covered over by a large synthetic liner. No permanent structure had been built to prevent future saturation of the soil from rainfall. The present liner was not owned by Berlex but rented.

- 3) No data on the sampling performed by Berlex was ever received by the USEPA, Environmental Services Division, Edison, NJ to confirm the clean-up by Berlex.
- 4) The re-routing of existing laboratory discharges to a self-contained unit and portable toilet facilities was not observed.
- 5) On October 10, 1985, Dr. A. L. Kyles, Vice President, Enviro-Sciences, the consultant working with Berlex (ICC) informed me that 192, 55-gallon drums of waste was removed from Berlex for disposal. The material consisted of the following:
 - Process pit water and sludge.
 - Drums and soil from the wastewater drainage line.
 - 1, 55-gallon drum of water/toluene.
 - Toluene contaminated soil.

No manifest copies were received to confirm this shipment.

- 6) Hazardous material was stored on-site for greater than 90 days and in quantities greater than 1000 kg. Berlex is then subject to the regulations 40 CFR Parts 262 and 264. None of these regulations were observed to have been followed.
- 7) In review, a question is raised that a possible source of contamination is that of the dry creek bed. Process wastewater was discharged via a drainage line to the creek bed. Since the drainage line and soil associated with the line was found contaminated, the possibility of soil contamination in the creek is likely and should be investigated.

DISCUSSION

Applicable Regulations

40 CFR Parts 262 and 264.

Purpose of Survey

A RCRA compliance evaluation and sampling inspection (CEI) was conducted at Berlex Laboratories (ICC), St. Croix, VI on September 9, 1985. The survey was conducted at the request of the Solid Waste Branch to support and verify Berlex's decontamination and removal of soil contaminated with toluene and pyridine.

The elements of the survey included a compliance record review, site survey and sampling.

Facility History

The Berlex Laboratories, Inc. plant, under the name Island Chemical Company (ICC), produced quinidine from November, 1979 after purchasing the site from Cooper Laboratories, until late 1982. In October 1982, Berlex notified EPA of the forthcoming closure and removal of waste materials and excess chemicals (xylene, toluene) from the site to Island Chemical of Puerto Rico. EPA assigned Berlex the ID No. VID80651095. Prior to the removal, Berlex was operating as a small quantity generator.

Berlex sold the site in September 1984, 21 months after the shut-down of operations to Virgin Island Chemical Co. The sales contract for the site called for the contractor Enviro-Sciences, Inc. (ESI), 19 Copeland Road, Denville, NJ to survey the site and certify it as environmentally clean. An ESI sampling survey initiated in September 1984 disclosed two areas of soil contamination, with the compounds of concern being toluene and pyridine.

On December 21, 1984 Enviro-Sciences, Inc. delivered a progress report describing ESI's sampling and analysis of soil at the Berlex site on St. Croix and included recommendation for treatment of the pyridine (U196) and toluene (U220) contaminated areas.

The recommended on-site treatment was selected by ESI as a more economical method than the alternative off-site shipment of drummed soil to the U.S. mainland for placement in an approved landfill. The proposed method of clean-up includes the drying of toluene contaminated soil (which is presently stored at the facility in drums) and degradation of pyridine contaminated soil. This would occur by exposure to ambient air causing soil aeration. Soil saturation by rainfall would be prevented by covering the area with a synthetic liner.

The toluene contamination resulted from soil leaks/spills at a tank site and pyridine contamination from leaks from a laboratory drain line. The estimated quantity of the two materials (toluene and pyridine) are less than 245 pounds.

On May 15, 1985, ESI reported the intended initiation of clean-up activities on June 6, 1985.

Facility Description and Operation

The Berlex Laboratories, Inc. (Berlex) plant under the name Island Chemical Co. (ICC); located in St. Croix, Virgin Island started producing quinidine gluconate in November 1979 and operated for 2 years. During operations Berlex employed 215 people on a 2 shift, 5 day/week, work schedule. Maximum production output was estimated at 50 tons/year, but this level was never reached. The first production batch by Berlex was November 1, 1979 (see Site Location Map, Figure 1).

Berlex (ICC), St. Croix, VI manufactured as their sole product quinidine gluconate. The basic raw materials used in production included quinine sulfate, toluene, and methanol. Production involved the conversion of quinine sulfate into quinine gluconate by the addition of toluene in a reaction vessel. The liquid was then distilled with methanol to produce the crystalline solid, quinidine gluconate.

Within the production area, the facility housed the following reaction vessels:

Reaction Vessels

<u>Number of Vessels</u>	<u>Material Construction</u>	<u>Capacity</u>
4	Stainless Steel	1200-1500 gallons
1	Carbon Steel	1200 gallons
1	Glass Lined	3000 gallons
1	Glass Lined	2000 gallons
3	Glass Lined (Receivers)	2000 gallons

Bulk raw materials arrived in tank trucks and were stored on-site in 14, 8000 gallon raw material tanks (see photograph #1).

Water Usage and Treatment

Groundwater was the primary source of water used in production. Approximately 20,000 gallons were used, of which, 10,000 gallons were recovered. Water was pretreated by filtering and adjusting pH (with sulfuric acid) due to the high carbonate concentration in the groundwater. The facility also housed the following systems (and tanks):

<u>Number of Tanks</u>	<u>Capacity</u>	<u>Systems</u>
1	15,000 gallons	Boiler System
1	15,000 gallons	Drinking Water (rainwater)
4	50,000 gallons	Recirculated Cooling Water
1	20,000 gallons	Reduction/Oxidation Unit
1	250,000 gallons	Firetank

Wastewater from production operations (primarily cooling water) was collected in a 17,000 gallon underground concrete, process pit. No treatment was applied but prior to discharge, the pit was sampled to see if any product was released by accident. If nothing showed in the sampling, the water was discharged via an underground pipe to a dry creek adjacent to facility property.

Waste Streams

Hazardous wastes at Berlex (ICC) were generated from the following sources:

1) Process Pit Water and Sludge

The 17,000 gallon underground concrete pit used to contain production wastewater and accumulate settled sludge from this wastewater.

2) Former Main Wastewater Drainage Line

The underground pipe (constructed of welded 55-gallon drums) from the process pit to dry creek bed. The pipeline was excavated due to the finding of numerous leaks and punctures from which wastewater had contaminated the soil (see Figure 2, areas of contamination).

3) Contaminated Soil Due to Drainage Line Leakage

A) Contaminated soil associated with the excavation of the main wastewater drainage line.

B) Contaminated soil due to drainage line leakage from the laboratory drain.

- 4) Contaminated soil from raw material spillage - toluene, pyridine.

The spills associated with material transfer and tank or line leakage. Includes soil under the concrete surface loading dock, along trench number 4, under concrete slab number 3, between tanks numbered 8 and 9, and along trench number 9 (see Figure 2, areas of contamination).

- 5) Contaminated or off-specification raw materials which could neither be reworked nor sold.

Prior to the facility's shutdown, Berlex (ICC) was said to be operating as a small quantity generator. What Berlex did with waste prior to the requested hazardous waste shipment (October 27, 1982) is unknown.

Treatment Methodology

As a result of sampling performed by Enviro-Science, Inc. (ESI) to certify how environmentally clean the site was, ESI disclosed two areas of soil contamination by toluene and pyridine (see figure #2, Plot Plan Showing Areas of Contamination). In response to such a disclosure, ESI recommended on-site treatment as an alternative to the economically unfeasible transport of the waste to the U.S. mainland.

Reference document #1, contained the following methodology of treatment which was to be followed:

° Toluene

The toluene contaminated soil would be placed on trays in a dryer located within the facility (see Figure 3, location of drying oven).

Soils with low and high toluene concentration were permitted to be mixed to insure uniform drying. The empty drums from which the excavated material was stored would be washed with a nonphosphate detergent, rinsed with tap water and then air dried. Drum washings would be collected and later evaporated in the dryer. These same drums would be used to store the air-dried soil until laboratory analysis indicates that it is free of toluene or has very low concentration. If the soil is found to be free of toluene or at very low levels (2 ppm, reference document #2), it will be redistributed on the site.

Prior to beginning the drying operation, calculations will be made using the fan speed, oven temperature, and stack diameter to insure that emission rates for toluene do not exceed 200 ppm TLV. This concentration in air is not flammable. If calculations show that this control rate is marginal, then a carbon pot will be added to insure this limit would not be exceeded (see photographs #4 & #5).

° Pyridine

The pyridine contaminated area would be treated in a 3 step approach.

- 1) The pyridine contaminated area would be covered over to prevent the saturation of soil from rainfall (see photograph #6).
- 2) The concrete surface loading dock in the vicinity of the pyridine contaminated areas would be removed using a backhoe and hauled to a landfill or used to stabilize the bank along the dry river bed. The Department of Public Works would be contacted for permission to do the latter.
- 3) The pyridine contaminated soil would be tilled and aerated using a backhoe at 2-3 day intervals. Soil turning would allow exposure of the contaminated soil to ambient air.

Samples would be taken at the beginning of the cleaning operation and continue at weekly intervals until acceptable pyridine levels are reached (2 ppm, reference document #2). When the pyridine level has decreased to zero or an acceptable level the area will be restored and resurfaced according to the owner's requirements.

Waste Storage

Berlex at the time of inspection was storing waste material in two areas:

1) Outside Fenced Storage Area

During facility operations, this was used as a raw material storage area. It consists of a 50' x 20' concrete pad surrounded by a chain-link fence. At the time of inspection, 1, 55-gallon drum containing approximately 40 gallons of a water/toluene mixture was being stored. Other empty 55-gallon drums were also present (see photograph #2 & #3, Outside Drum Storage Area).

2) Warehouse Storage

This area was used by Berlex as their major raw material storage area. At the time of inspection, 20, 55-gallon drums of toluene contaminated soil were being stored prior to treatment in the drying oven (see photographs #12, #13, & #14). Large numbers of 55-gallon drums containing raw materials used in production were also being stored in the warehouse.

Manifested Shipments

After the shutdown of plant operations in late 1982, the raw materials which remained on-site in the facility's above-ground storage tank were removed (including toluene and xylene). The transporters and TSD used for these shipments were as follows:

Transporters

Trailer Marine Transport Corp. PRD980644579
Isla Grande, Puerto Rico

Transporte Diaz PRD980526834
Zona Portuaria, Puerto Nuevo, San Juan, Puerto Rico

TSD

Island Chemical of P.R. Inc. PRD090399718
Km 51, Highway #2, Manati, Puerto Rico

The manifests are enclosed as Attachment IV.

According to Dr. A. L. Kyles, Vice President of Enviro-Science, the consultant working with Berlex (ICC), 192, 55 - gallon drums of waste was removed from the Berlex (ICC) facility on October 10, 1985. The drum contents consisted of the following material:

- ° Process pit water and sludge
- ° Drums and soil from the wastewater drainage line
- ° 1, 55-gallon drum of water/toluene
- ° Toluene contaminated soil

No manifest copies were ever received on the shipments from Dr. Kyles.

Sampling Procedures

On September 9, 1985 samples were taken at Berlex (ICC), St. Croix, Virgin Island from the following areas:

- ° Composite soil sample from the drying oven (left side).
Sample #087001
- ° Composite soil sample from the drying oven (right side).
Sample #087002
- ° Surface soil composite from the north side of the Lab Waste Drainage Area.
Sample #087003

- ° Subsurface soil composite from the north side of the Lab Waste Drainage Area.
Sample #087004
- ° Surface soil composite from the south side of the Lab Waste Drainage Area.
Sample #087005
- ° Subsurface soil composite from the south side of the Lab Waste Drainage Area.
Sample #087006

Attachment III contains copies of the sample data sheets.

Within the drying oven, the soil was placed on steel trays and stacked in 13, 20 tray bins. A division of the dryer into the left side and right side was made and a composite sample was taken from a representative number of trays. See Figure 4, for sample locations. Photographs #4 and #5, show the location of the drying oven.

To take a more representative sample of the Lab Waste Drainage Area, the area was divided into two sections: north and south. Surface soil samples were taken using trowels and subsurface soil samples (approx. 3 foot depth) were taken using dedicated bucket augers. Due to the very resistant nature of the soil (impermeable clay) only a sample depth of three feet could be obtained. See Figure 5, for sample locations. Photographs #7, #8, #9, #10, and #11, shows the areas of sampling.

Sampling equipment and containers were prepared according to EPA standard procedures prior to sampling. A total of six samples were taken.

The samples were analyzed for purgeable (POA) and non-volatile (NVOA) organic priority pollutants. All analyses were performed in EPA's Edison, New Jersey laboratory. EPA standard procedures were followed for the collection of samples throughout the survey. Samples were not split with facility representatives. Receipt for samples (Attachment I) and chain-of-custody methods forms (Attachment II) were employed for all samples taken.

Sample Results

Sample results are given in Table I.

Organic analysis on samples #087001 and #087002 (drying oven) detected the following organic compounds ranging in values from 460 ppb to 15,000,000 ppb: toluene, flourene, bis(2-ethyl hexyl) phthal, benzphenone and di-n-octyl phthalate (detected only in sample #087002).

Organic analysis on samples #087003, #087004, #087005 and #087006 (lab waste drainage area) detected the following organic compounds ranging in values from 360 ppb to 75,000 ppb: toluene, bis(2-ethylhexyl) phthalate, di-n-octyl phthalate, chloroform, benzene and di-n-butyl phthalate.

From the results the toluene values were found within the acceptable range of 2 ppm. No laboratory analysis was performed for pyridine due to late arrival of guidance on pyridine protocol from EPA Research Laboratories, Cincinnati.

Reference Documents

- 1) Enviro-Science Inc., Progress Report, Island Chemical Company, Inc. (Berlex), April 4, 1985.
- 2) U.S. Environmental Protection Agency, Review of a Report on Proposed Soil Decontamination by Enviro-Sciences, Inc.
- 3) U.S. Environmental Protection Agency, Fact Sheet, Requests to Treat Contaminated Soil at St. Croix Plant Site, February 5, 1985.
- 4) U.S. Environmental Protection Agency, ICC/Berlex Plant Site, St. Croix Fact Sheet Including Preliminary Analytical Results on Nearby Well Fields.

Table I

Results of Organics Analysis on Samples

Organic Compounds	Sample# 087001 ug/kg	Sample# 087002 ug/kg	Sample# 087003 ug/kg	Sample# 087004 ug/kg	Sample# 087005 ug/kg	Sample# 087006 ug/kg
Toluene	460	560	420	440	360	400
Flourene	9200	1300				
Bis(2-ethylhexyl)Phtha- -late	13000	4700	16000	1900	51000	36000
Benzophenone	15000000	2600000				
Di-n-octyl Phthalate		500J		4200	600J	2000
Chloroform				200K		
Benzene				200K		
Di-n-butyl Phthalate						75000

Sample #087001 - Aerated Soil Composite from Storage Room (left side)

Sample #087002 - Aerated Soil Composite from Storage Room (right side)

Sample #087003 - Surface Soil Composite from North Side of Lab Waste Drainage Area

Sample #087004 - Subsurface Soil Composite from North Side of Lab Waste Drainage Area

Sample #087005 - Surface Soil Composite from South Side of Lab Waste Drainage Area

Sample #087006 - Subsurface Soil Composite from South Side of Lab Waste Drainage Area

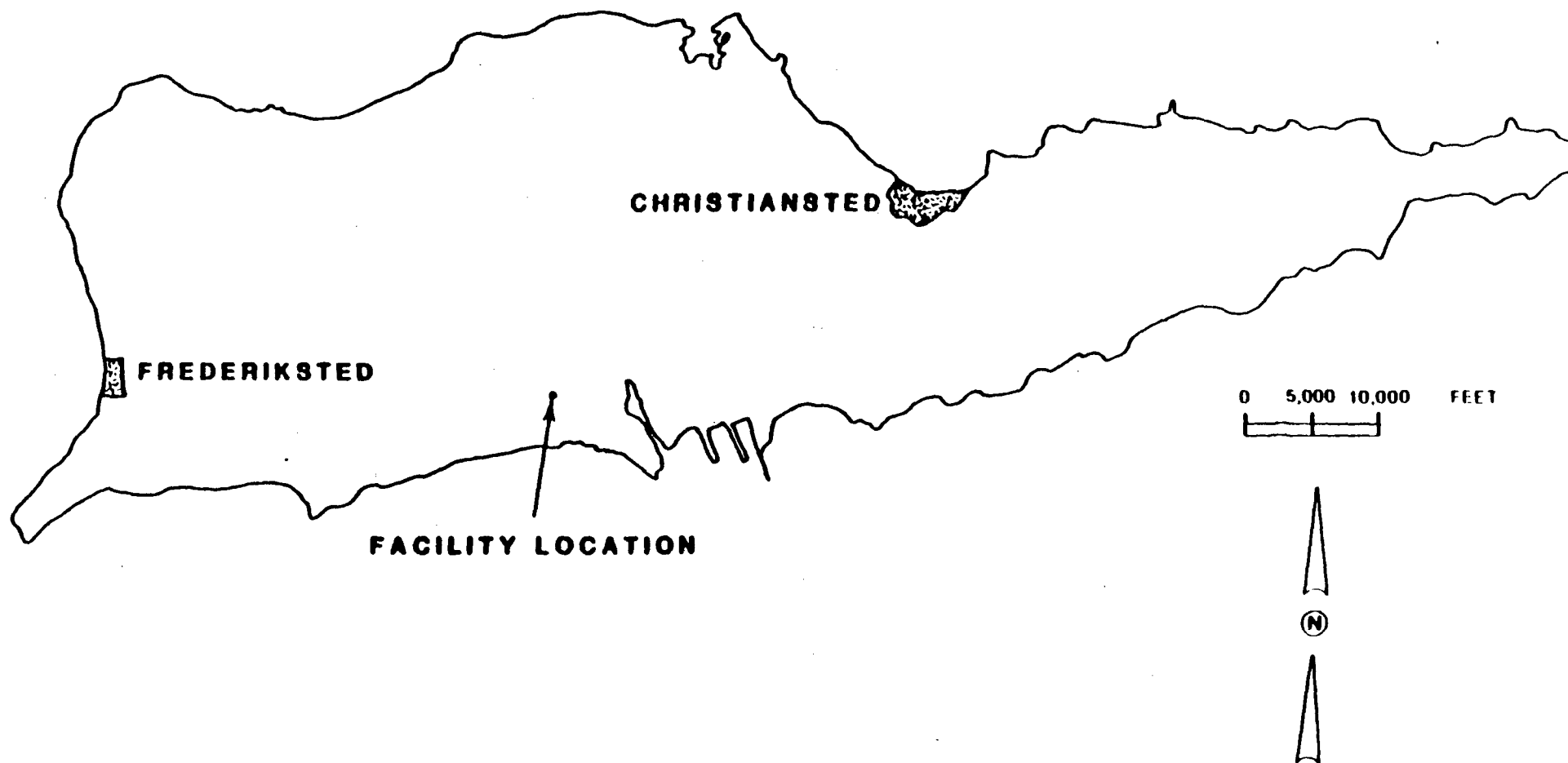
K - Actual value known to be less than value given

J - Estimated value

Blank Space - Material Analyzed but not detected

FIGURE 1

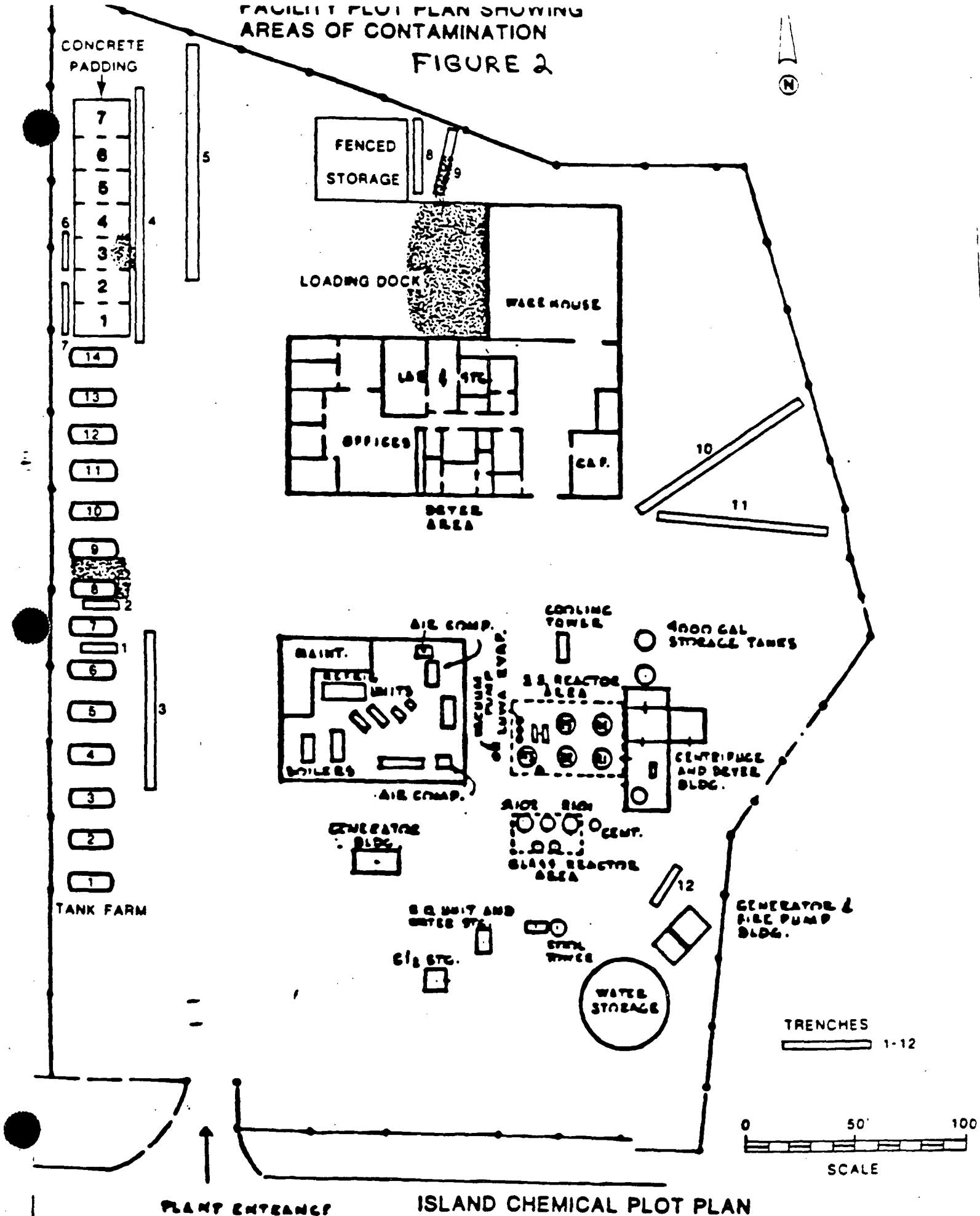
FACILITY LOCATION MAP



**SOURCE: COMPREHENSIVE WATER RESOURCES
MANAGEMENT PLAN FOR THE UNITED
STATES VIRGIN ISLANDS, 1983.**

FACILITY PLOT PLAN SHOWING AREAS OF CONTAMINATION

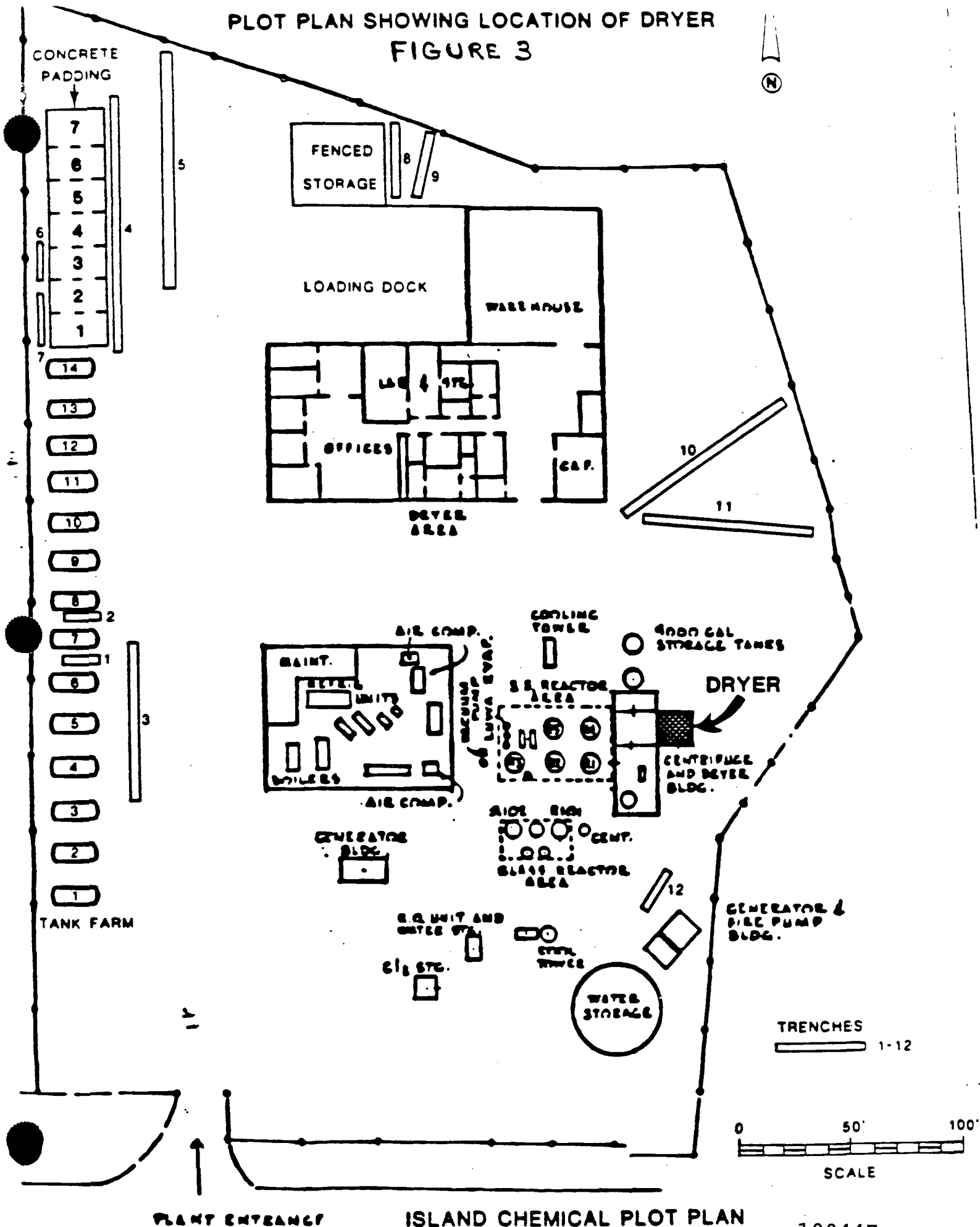
FIGURE 2



ISLAND CHEMICAL PLOT PLAN

100446

PLOT PLAN SHOWING LOCATION OF DRYER FIGURE 3



PLANT ENTRANCE

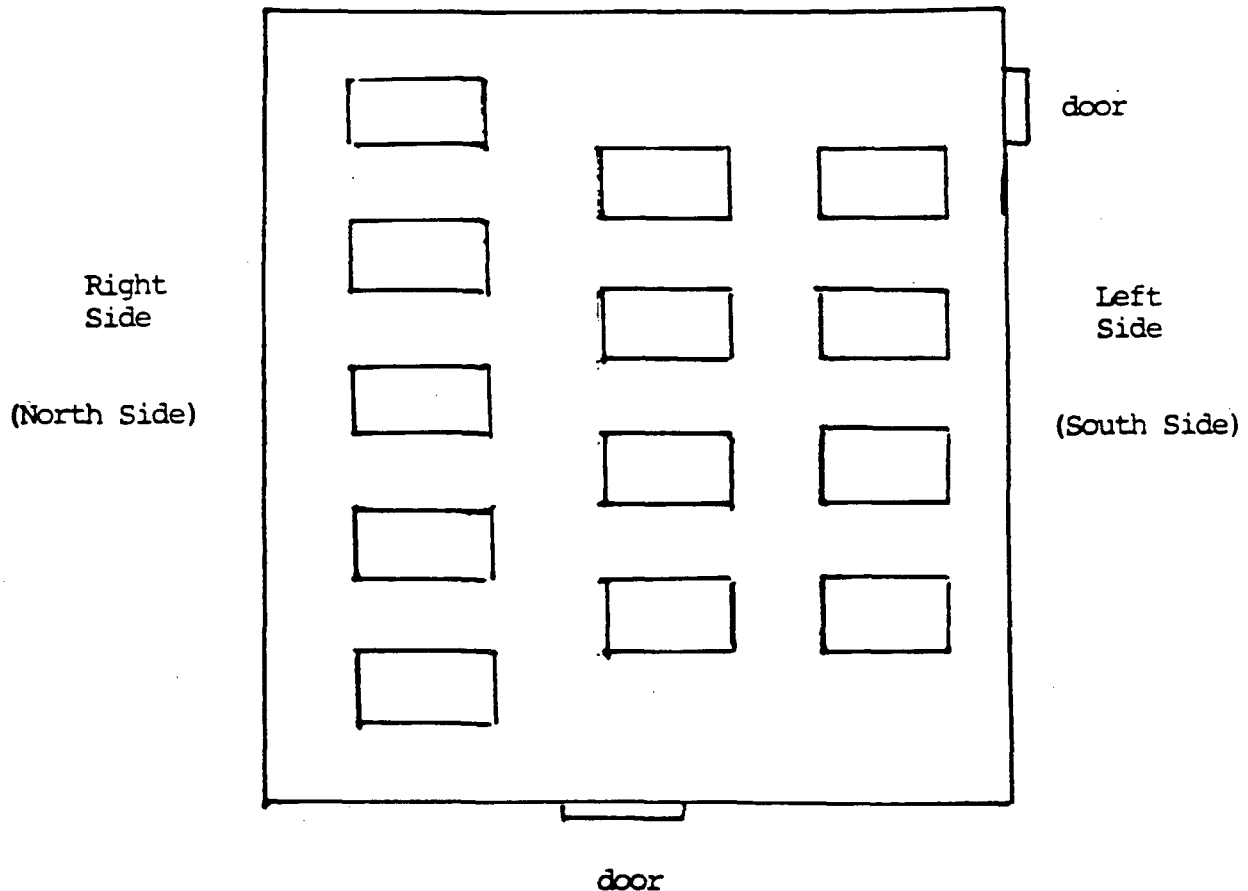
ISLAND CHEMICAL PLOT PLAN

100447

DRYING OVEN

- toluene contaminated soil

(Top View)



NORTH

Composite soil sample from drying oven

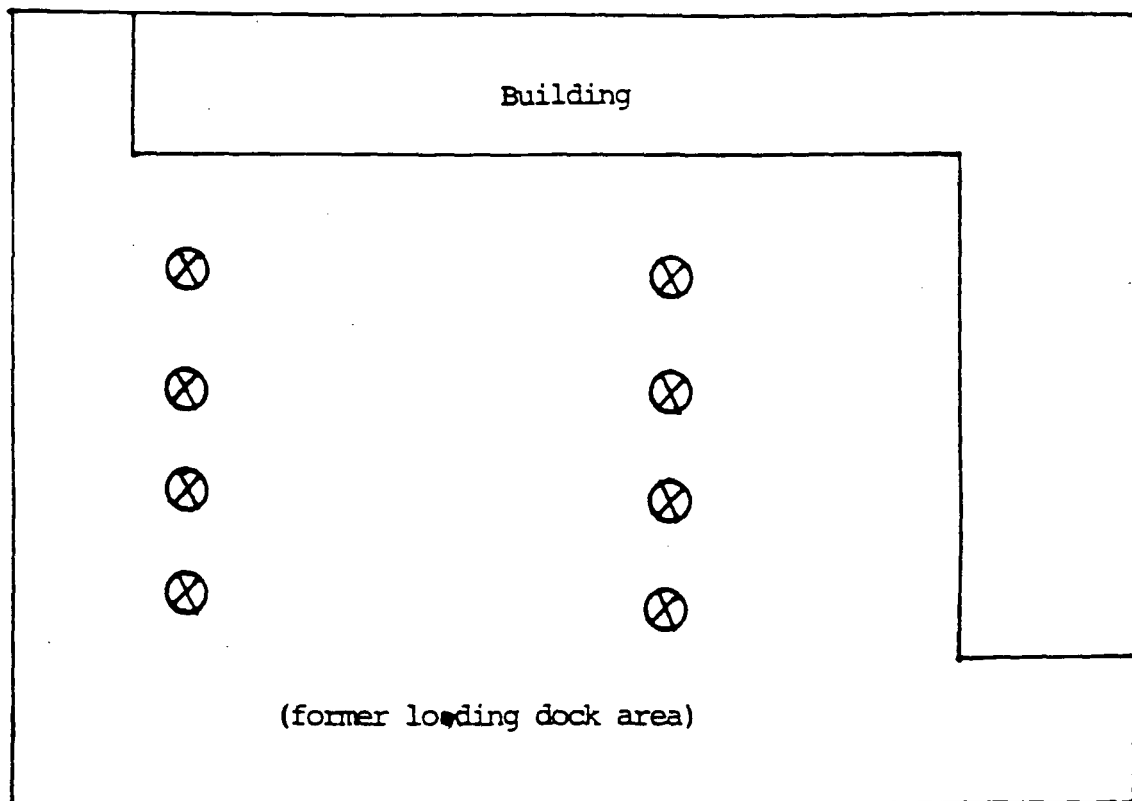
- #087001 - left side (south side)
- #087002 - right side (north side)

(Not to Scale)

* Each rectangle represents one bin containing a stack of twenty trays.

LAB WASTE DRAINAGE AREA

- pyridine contaminated soil



⊗ - Sample locations for composite

←
NORTH

Soil sample from north side of the Lab Waste Drainage Area

° Surface - #087003

° Subsurface - #087004

Soil sample from south side of the Lab Waste Drainage Area

° Surface - #087005

° Subsurface - #087006

(Not to Scale)

Figure 5 - Sample Location Map - Lab Waste Drainage Area

ATTACHMENT I

Receipt For Samples

Berlex Laboratories
St. Croix. VI

September 9, 1985

RECEIPT FOR SAMPLES CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
Environmental Services Division
EDISON, NEW JERSEY 08817

Name of Unit and Address:		Berlex Laboratories (V.I. Chemical) VID 80651095			9/9/85	

Sample Number	Number of Containers	Description of Samples
087001	1	Qt. - NVOA
	2	40 ml vials
} Aerial Soil - Composite		
087002	1	Qt. - NVOA
	2	40 ml vials
} Aerial Soil - Composite		
087003	1	Qt. - NVOA
	2	40 ml vials
} Surface Soil - Composite		
087004	1	Qt. - NVOA
	2	40 ml vials
} Subsurface Soil - Composite		
087005	1	Qt. - NVOA
	2	40 ml vials
} Surface Soil - Composite		
087006	1	Qt. - NVOA
	2	40 ml vials
} Subsurface Soil - Composite		

9/9/85

Long O. Lee US EPA

Ref 9/9/85-202

Person Assuming Responsibility for Sample:						Time	Date

Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody

ATTACHMENT II

Chain of Custody Form

Berlex Laboratories
St. Croix. VI

September 9, 1985

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
Environmental Services Division
EDISON, NEW JERSEY 08817

Name of Unit and Address: Berlex Laboratories Inc. St. Croix, Virgin Islands USA VID 80651095					
Sample Number	Number of Containers	Description of Samples			
087001	1	Qt. Jar NVOA w/ice			
	2	40 ml Vials w/ice			
087002	1	Qt. Jar NVOA w/ice			
	2	40 ml Vials w/ice			
087003	1	Qt. Jar NVOA w/ice			
	2	40 ml Vials w/ice			
087004	1	Qt. Jar NVOA w/ice			
	2	40 ml Vials w/ice			
087005	1	Qt. Jar NVOA w/ice			
	2	40 ml Vials w/ice			
087006	1	Qt. Jar NVOA w/ice			
	2	40 ml Vials w/ice			

Person Assuming Responsibility for Sample: Lorne D. Delli					Time 1:00 PM	Date 9/14/85

Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
087001 to 087006	Lorne D. Delli 9/14/85	Kevin Petrus	10:00 PM	9/14/85	Shipment of Samples to Lab
087001 to 087006	Kevin Petrus	R. Miller	7:45 AM	9/14/85	Log in at OSCAR
087001 to 087006	R. Miller	R. M. Mason	1:30 PM	9/11/85	For Analysis
087001 to 087006	R. M. Mason	Oscar Goldberg	2:00 PM	9/11/85	For PBA and NVOA Analysis

ATTACHMENT III

Sample Data Sheets

Berlex Laboratories
St. Croix. VI

September 9, 1985

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

UEF

Project Name Berlex Lab Inc. Site, VI
Collector(s) D. Guardia Affiliation US EPA

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowel Cream Dipper
Automatic
Other _____

LDMS CODE _____

DATA BASE CODE _____

STA. TYPE CODE _____

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
Solvent Extract Other Soil

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container
Glass Jar - 1
Plastic Jar
Metal
POA Vial - 2
Cubitainer
Acetate Core
Paper Cap
Teflon Cap
Foil Cap
Other _____
Preservation
Acid _____
Solvent _____
Chemical _____
Wet Ice
Dry Ice
Ambient
Other _____

Cleaning Procedure

Detergent Wash
Water Rinse
Acid Rinse
Solvent Rinse:
Acetone
Hexane
Methylene Chloride
Other (Specify): _____

Sample Source Type (Circle)

Landfill
Leachate
Drum
Test Well
Depth: _____
Other: _____
Storage Tank
Top
Middle
Bottom
Truck
Drum
Tank
Other: _____
Wells
Monitoring
Production
Drinking
Private

Industrial
Effluent
Process Stream
Holding Pond
Drum
Waste Pile
Municipal Treatment
Influent
Effluent-CI
Effluent-Non CI
Sludge
Ambient
Lake
Stream
Pond
Ocean
Estuary

Sample Location Description:

aerated soil composite from
storage room (left side)

Remarks:

1-qt. NVCA jar } iced
2-40 ml POA vials }
contaminated soil from
toluene spill.

Samples to:

Bact ☐ Bio ☐ Chem ☒ Other ☐

Station No.

VE080651095

Sample Depth (ft.)/Fac. Loc. Code

3200

Lab Number

087001

Type of Sample

Grab ☐ Composite ☒

Time ☐ Space ☒

Collection (Ending) Date

Yr 85 Mo 09 Day 09

Ending Time (24 Hr)

1100

Beginning Date

Yr 85 Mo 09 Day 09

Beginning Time (24 Hr)

1043

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☐ Yes ☒ No

If Yes With Whom?

Receipt ☐ Yes ☐ No

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

UEF

Project Name Berex Laboratories (Island) Environmental Corp. #2
Collector(s) D. G. Gardis Affiliation EPA-ESD

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowl Cream Dipper
Automatic
Other _____

LDMS CODE _____

DATA BASE CODE _____

STA. TYPE CODE _____

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
Solvent Extract Other (Soil)

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container
Glass Jar
Plastic Jar
Metal
POA Vial
Cubitainer
Acetate Core
Paper Cap
Teflon Cap
Foil Cap
Other _____
Preservation
Acid _____
Solvent _____
Chemical _____
Wet Ice
Dry Ice
Ambient
Other _____

Cleaning Procedure

Detergent Wash
Water Rinse
Acid Rinse
Solvent Rinse:
Acetone
Hexane
Methylene Chloride
Other (Specify): _____

Sample Source Type (Circle)

Landfill
Leachate
Drum
Test Well
Depth:
Other: _____
Storage Tank
Top
Middle
Bottom
Truck
Drum
Tank
Other: _____
Wells
Monitoring
Production
Drinking
Private

Industrial
Effluent
Process Stream
Holding Pond
Drum
Waste Pile
Municipal Treatment
Influent
Effluent-CI
Effluent-Non CI
Sludge
Ambient
Lake
Stream
Pond
Ocean
Estuary

Sample Location Description:

Aerated soil composite from right side
of storage room plus contained on floor

Remarks:

NVOA - 1 quart glass jar
FOA's - 2 glass vials

Contaminated soil from toluene spill

Samples to:

Bact ☐ Bio ☐ Chem ☒ Other ☐

Station No.

VID 804 E 1075

Sample Depth (Ft.)/Fac. Loc. Code

3201

Lab Number

087002

Type of Sample

Grab Composite

Time ☐ Space ☒

Collection (Ending) Date

Yr Mo Day
850909

Ending Time (24 Hr)

1113

Beginning Date

Yr Mo Day
850909

Beginning Time (24 Hr)

1100

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☐ Yes ☒ No

If Yes With Whom?

Receipt ☐ Yes ☐ No

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

UEF

Project Name Berlex Lab, Inc. St. Croix, VI
Collector(s) D. Guendie Affiliation USEPA

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowel Cream Dipper
Automatic
Other _____

LDMS CODE _____

DATA BASE CODE _____

STA. TYPE CODE _____

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
Solvent Extract Other Soil

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container
Glass Jar - 1
Plastic Jar
Metal
POA Vial - 2
Cubittainer
Acetate Core
Paper Cap
Teflon Cap
Foil Cap
Other _____
Preservation
Acid _____
Solvent _____
Chemical _____
Wet Ice
Dry Ice
Ambient
Other _____

Cleaning Procedure

Detergent Wash
Water Rinse
Acid Rinse
Solvent Rinse:
Acetone
Hexane
Methylene Chloride
Other (Specify): _____

Sample Source Type (Circle)

Landfill Industrial
Leachate Effluent
Drum Process Stream
Test Well Holding Pond
Depth: Drum
Other: Waste Pile
Municipal Treatment
Storage Tank Influent
Top Effluent-CI
Middle Effluent-Non CI
Bottom Sludge
Truck Ambient
Drum Lake
Tank Stream
Other Pond
Ocean
Wells Estuary
Monitoring
Production
Drinking
Private

Samples to:

Bact ☐ Bio ☐ Chem ☒ Other ☐

Station No.

VID80651095

Sample Depth (Ft.)/Fac. Loc. Code

3202

Lab Number

087003

Type of Sample

Grab Composite
Time Space ☒

Collection (Ending) Date

Yr Mo Day
850909

Ending Time (24 Hr)

1200

Beginning Date

Yr Mo Day
850909

Beginning Time (24 Hr)

1140

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☐ Yes ☒ No

If Yes With Whom?

Receipt ☐ Yes ☐ No

Sample Location Description:

Surface soil composite from north side of laboratory waste drainage area

Remarks:

1-qt NVOA jar } iced
2.40 ml POA Vials }

clayey soil, somewhat wet

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

UEF

Project Name Borlex Laboratories Inc. (Holland Chem. Co.)
Collector(s) L. Guardia Affiliation EPA-ESD

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowe Cream Dipper
Automatic
Other _____

LDMS CODE _____

DATA BASE CODE _____

STA. TYPE CODE _____

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
Solvent Extract Other (Soil)

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container

Glass Jar

Plastic Jar

Metal

POA Vial

Cubitainer

Acetate Core

Paper Cap

Teflon Cap

Foil Cap

Other _____

Cleaning Procedure

Detergent Wash

Water Rinse

Acid Rinse

Solvent Rinse:

Acetone

Hexane

Methylene Chloride

Other (Specify): _____

Sample Source Type (Circle)

Landfill

Leachate

Drum

Test Well

Depth: _____

Other: _____

Storage Tank

Top

Middle

Bottom

Truck

Drum

Tank

Other: _____

Wells

Monitoring

Production

Drinking

Private

Industrial

Effluent

Process Stream

Holding Pond

Drum

Waste Pile

Municipal Treatment

Influent

Effluent-Cl

Effluent-Non Cl

Sludge

Ambient

Lake

Stream

Pond

Ocean

Estuary

Preservation

Acid _____

Solvent _____

Chemical _____

Wet Ice

Dry Ice

Ambient

Other _____

Sample Location Description:

Subsurface soil sample from lab drainage area

Remarks:

NVOA - 1 qt glass jar
FOA - 2 glass vials
Clayey soil

Samples to:

Bact ☐ Bio ☐ Chem ☒ Other ☐

Station No.

VI D 80651095

Sample Depth (Ft.)/Fac. Loc. Code

3203

Lab Number

087004

Type of Sample

Grab ☐ Composite ☐
Time ☐ Space ☒

Collection (Ending) Date

Yr Mo Day
850909

Ending Time (24 Hr)

1155

Beginning Date

Yr Mo Day
850909

Beginning Time (24 Hr)

1140

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☐ Yes ☒ No

If Yes With Whom?

Receipt ☐ Yes ☐ No

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

UEF

Project Name Borlex Labs Inc. St Louis VI
Collector(s) D. Gurd. 9 Affiliation USEPA

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowel Cream Dipper
Automatic
Other _____

LDMS CODE _____

DATA BASE CODE _____

STA. TYPE CODE _____

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
Solvent Extract Other Soil

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container Glass Jar - 1
Plastic Jar Water Rinse
Metal POA Vial - 2
Cubittainer
Acetate Core
Paper Cap
Teflon Cap
Foil Cap
Other _____
Preservation
Acid _____
Solvent _____
Chemical _____
Wet Ice
Dry Ice
Ambient
Other _____

Cleaning Procedure
Detergent Wash
Water Rinse
Acid Rinse
Solvent Rinse:
Acetone
Hexane
Methylene Chloride
Other (Specify): _____

Sample Source Type (Circle)

Landfill
Leachate
Drum
Test Well
Depth: _____
Other: _____
Storage Tank
Top
Middle
Bottom
Truck
Drum
Tank
Other _____
Wells
Monitoring
Production
Drinking
Private
Industrial
Effluent
Process Stream
Holding Pond
Drum
Waste Pile
Municipal Treatment
Influent
Effluent-Cl
Effluent-Non Cl
Sludge
Ambient
Lake
Stream
Pond
Ocean
Estuary

Samples to:

Bact Bio Chem ☒ Other

Station No.

VI 020651095

Sample Depth (Ft.)/Fac. Loc. Code

3204

Lab Number

087005

Type of Sample

Grab Composite
Time Space ☒

Collection (Ending) Date

Yr Mo Day
85 09 09

Ending Time (24 Hr)

1155

Beginning Date

Yr Mo Day
85 09 09

Beginning Time (24 Hr)

1140

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☐ Yes ☒ No

If Yes With Whom?

Receipt ☐ Yes ☐ No

Sample Location Description:

Surface soil composite from ^{DA} south side of laboratory waste drainage area.

Remarks:

1-qt. NVGA } used
2-40ml POA vials }
clayey soil

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

UEF

Project Name Parker Laboratories Inc. (Island Chemical Co.)

Collector(s) D. G. Gordon Affiliation EPA - E. I.

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowel Cream Dipper
Automatic
Other _____

LDMS CODE _____

DATA BASE CODE _____

STA. TYPE CODE _____

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
Solvent Extract Other Soil

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container	Cleaning Procedure
<u>Glass Jar</u>	<u>Detergent Wash</u>
<u>Plastic Jar</u>	<u>Water Rinse</u>
<u>Metal</u>	<u>Acid Rinse</u>
<u>POA Vial</u>	Solvent Rinse:
Cubitainer	Acetone
Acetate Core	Hexane
Paper Cap	<u>Methylene Chloride</u>
<u>Teflon Cap</u>	Other (Specify): _____
Foil Cap	
Other _____	
Preservation	
Acid _____	
Solvent _____	
Chemical _____	
<u>Wet Ice</u>	
Dry Ice	
Ambient	
Other _____	

Sample Source Type (Circle)

Landfill	Industrial
Leachate	Effluent
Drum	Process Stream
Test Well	Holding Pond
Depth: _____	Drum
Other: _____	Waste Pile
	Municipal Treatment
Storage Tank	Influent
Top	Effluent-CI
Middle	Effluent-Non CI
Bottom	Sludge
Truck	Ambient
Drum	Lake
Tank	Stream
Other _____	Pond
	Ocean
Wells	Estuary
Monitoring	
Production	
Drinking	
Private	

Samples to:

Bact Bio Chem ☒ Other

Station No.

V1D8065109

Sample Depth (Ft.)/Fac. Loc. Code

3205

Lab Number

087006

Type of Sample

Grab Composite

Time Space ☒

Collection (Ending) Date

Yr Mo Day
8 5 09 09

Ending Time (24 Hr)

1230

Beginning Date

Yr Mo Day
8 5 09 09

Beginning Time (24 Hr)

1205

pH

7.5

Sample Temp. (°C)

20.5

DO (mg/l)

6.5

Cond. (uMHOS/CM)

150

Salinity(‰)

0

Sample Split

☐ Yes ☐ No

If Yes With Whom?

Receipt ☐ Yes ☐ No

Sample Location Description:

Substrate sample from lab drainage area

Remarks:

North - 1 glass jar
POA - 2 glass vials
Crystals, dark

ATTACHMENT IV

Waste Manifests

Berlex Laboratories
St. Croix. VI

September 9, 1985

100461

P H IC 08

100462

INSTRUCTIONS
PLEASE TYPE

COMMONWEALTH OF PUERTO RICO
ENVIRONMENTAL QUALITY BOARD
HAZARDOUS WASTE MANIFEST

PART

DOCUMENT NO

P R IC 07

GENERATOR NAME Island Chemical Co., Inc.	PHONE (809) 778-2200	EPA ID NO V11D918065105
SITE ADDRESS Estate 130, Estate Bethlehem, St. Croix, U.S. Virgin Islands		
TRANSPORTER NO 1 Trailer Marine Transport Corporation	PHONE (809) 721-1313	P1R1D918064457
SITE ADDRESS Isla Grande, Puerto Rico		
TRANSPORTER NO 2 Transporte Diaz	PHONE (809) 792-7999	P1R1D9180521683
SITE ADDRESS Zona Portuaria, Puerto Nuevo, San Juan, Puerto Rico		
TREATMENT STORAGE OR DISPOSAL (TSD) FACILITY Inland Chemical of P.R., Inc.	PHONE (809) 854-1090	P1R1D9180319971
SITE ADDRESS Km. 51, Highway # 2, Manati, Puerto Rico		

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE

THIS FORM IS NO 1 OF A TOTAL OF 1 THE FIRST MANIFEST DOCUMENT NO IS P R I C 07

PROPER US DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS		EPA HAZ CODE	EQU/EF WASTE 1
						NO	TYPE		
1 Xylene RQ	Flam. Liquid	1307	L	31320	gal	1	TK	I	FQ
2									
3									
4									
5									
6									

SPECIAL HANDLING INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A NONHAZARDOUS NATURE WHICH DO NOT HAVE TO BE MANIFESTED)

GENERATOR'S CERTIFICATION: This is to certify that the above named materials are properly classified, described, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation, U.S. EPA and the Commonwealth of P.R. The waste described above were consigned to the Transporter named The Treatment, Storage or Disposal Facility can and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the foregoing is true and correct to the best of my knowledge.

GENERATOR'S SIGNATURE Jerome H. Ludwig	TITLE President	DATE SHIPPED 11/13/83	EXPECTED ARRIVAL DATE 12/1/83
TRANSPORTER NO 1 SIGNATURE "To the best of my knowledge the contents of the shipment, I have accepted for transport conform with the description on this manifest."	TRANSPORTER NO 1 VEHICLE SECS ID NO.	1912181211910	DATE RECEIVED PAT DAY

TEAM AT THIS TYPING STATION

PART B

GEN EPA ID#

V11D918065109

TRANSPORTER NO 1 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment."	DATE DELIVERED PAT DAY
TRANSPORTER NO 2 SIGNATURE "To the best of my knowledge the contents of the shipment I have accepted for transport conform with the description on this manifest."	TRANSPORTER NO 2 VEHICLE ID NO.
TRANSPORTER NO 2 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment."	DATE RECEIVED PAT DAY
TREATMENT STORAGE OR DISPOSAL FACILITY SIGNATURE "I certify that the contents of this shipment conform with the description on this manifest except those destroyed or lost on this form."	DATE RECEIVED PAT DAY
TREATMENT STORAGE OR DISPOSAL FACILITY SIGNATURE "I certify that the contents of this shipment conform with the description on this manifest except those destroyed or lost on this form."	
100463	
In case of emergency or spill immediately call the Environmental Quality Board 1-800-725-6397	

DOCUMENT NO

P R

**COMMONWEALTH OF PUERTO RICO
ENVIRONMENTAL QUALITY BOARD
HAZARDOUS WASTE MANIFEST**

PART A:

DOCUMENT NO

P R 10 06

GENERATOR NAME Island Chemical Co., Inc.	PHONE (809) 778-2200	P R 10 06 10 06 10 06 10 06 10 06
SITE ADDRESS Estate 130, Estate Bethlehem, St. Croix, U.S. Virgin Islands		
TRANSPORTER NO 1 Trailer Marine Transport Corporation	PHONE (809) 721-1313	P R 10 06 10 06 10 06 10 06
SITE ADDRESS Isla Grande, Puerto Rico		
TRANSPORTER NO 2 Transporte Diaz	PHONE (809) 722-7999	P R 10 06 10 06 10 06 10 06
SITE ADDRESS Zona Portuaria, Puerto Nuevo, San Juan, Puerto Rico		
TREATMENT, STORAGE OR DISPOSAL (TSD) FACILITY Inland Chemical of P.R., Inc.	PHONE (809) 854-1090	P R 10 06 10 06 10 06 10 06
SITE ADDRESS Km. 51, Highway # 2, Manati, Puerto Rico		

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE

THIS FORM IS NO 1 OF A TOTAL OF 1 THE FIRST MANIFEST DOCUMENT NO IS P R 10 06

PROPER ICS DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS		LUN EPA HAZ CODE	LUN EPA WASTE TYPE
						NO	TYPE		
1 Toluene RQ	Flam. Liquid	1294	L	13 7 2 4	Gal	1	TK	1	F 0 0
2									
3									
4									
5									
6									

EXEMPT HAZARDOUS WASTE INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADULTERANT OR RESIDUALS) AND OTHER INFORMATION REQUIRED BY THE TREATMENT, STORAGE OR DISPOSAL FACILITY (DO NOT HAVE TO BE MANIFESTED)

GENERATOR'S CERTIFICATION: This is to certify that the above named materials are properly classified, described, marked and labeled and are in proper condition for transportation and are being transported in accordance with the applicable regulations of the Department of Transportation, U.S. EPA and the Commonwealth of P.R. The waste described above is being shipped to the treatment, storage or disposal facility and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the information is true and correct to the best of my knowledge.

GENERATOR'S SIGNATURE <i>Jerome H. Ludwig</i> Jerome H. Ludwig	TITLE President	DATE SIGNED 11/10/18	EXPIRATION DATE 11/12/18
TRANSPORTER NO 1 SIGNATURE "To the best of my knowledge the contents of the shipment I have accepted for transport conform with the description on this manifest"	TRANSPORTER NO 1 VEHICLE ID NO SCXU 121311015103	DATE RECEIVED 11/10/18	DATE RECEIVED 11/10/18

MA Lervano SEAL AT THIS VERIFICATION: *440-31209*

PART B

GEN EPA UN

P R 10 06 10 06 10 06 10 06

TRANSPORTER NO 1 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment"	TRANSPORTER NO 1 VEHICLE ID NO	DATE DELIVERED 11/20/18
TRANSPORTER NO 2 SIGNATURE "To the best of my knowledge the contents of the shipment I have accepted for transport conform with the description on this manifest"	TRANSPORTER NO 2 VEHICLE ID NO	DATE RECEIVED 11/20/18
TRANSPORTER NO 2 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment"		
TREATMENT STORAGE OR DISPOSAL FACILITY INDICATION OF ANY DIFFERENCES BETWEEN MANIFEST AND SHIPMENT OR LISTING OR REASONS FOR AND DISPOSITION OF REJECTED MATERIALS		IDENTIFY REASON
TREATMENT STORAGE OR DISPOSAL FACILITY SIGNATURE "Upon visual inspection, I certify that the contents of this shipment conform with the description on this manifest except those discrepancies noted on this form"	<i>Signature</i>	DATE RECEIVED 11/20/18

HAZARDOUS WASTE MANIFEST

RT A:

DOCUMENT NO

P R IC 05

GENERATOR NAME Island Chemical Co., Inc.	PHONE (809) 778-2200	EPA ID NO V1D9B065109
SITE ADDRESS Estate 130, Estate Bethlehem, St. Croix, U.S. Virgin Islands		
TRANSPORTER NO 1 Trailer Marine Transport Corporation	PHONE (809) 721-1313	P1R1D9B064457
SITE ADDRESS Isla Grande, Puerto Rico		
TRANSPORTER NO 2 Transporte Diaz	PHONE (809) 792-7999	P1R1D9B052683
SITE ADDRESS Zona Portuaria, Puerto Nuevo, San Juan, Puerto Rico		
TREATMENT, STORAGE OR DISPOSAL (TSD) FACILITY Inland Chemical of P.R., Inc.	PHONE (809) 854-1090	P1R1D02039971
SITE ADDRESS Km. 51, Highway # 2, Manati, Puerto Rico		

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE

THIS FORM IS NO 1 OF A TOTAL OF 1 THE FIRST MANIFEST DOCUMENT NO IS

P. R.

IC 05

PROPER US DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS		EQU EPA MA7 CCG	LWB/EPA WASTE TV
						NO	TYPE		
1 Toluene RQ	Flam. Liquid	1294	L	14731	Gal	1	TK	1	F100
2									
3									
4									
5									
6									

SPECIAL HANDLING INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (ie IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A SIGNATURE OF THE PERSON WHOSE NAME IS ON THE MANIFEST)

GENERATOR'S CERTIFICATION: This is to certify that the above named materials are properly classified, described, marked and labeled and are in proper condition for transport according to the applicable regulations of the Department of Transportation U.S. EPA and the Commonwealth of P.R. The waste described above were transported to the treatment, storage or disposal facility and will accept the shipment of hazardous waste, and has a valid permit to do so I certify that the foregoing is true and correct to the best of my knowledge.

GENERATOR'S SIGNATURE <i>Jerome H. Ludwig</i> Jerome H. Ludwig	TITLE President	DATE SHIPPED 11/01/83	EXPECTED ARRIVAL DATE 11/24/83
TRANSPORTER NO 1 SIGNATURE "To the best of my knowledge the contents of the shipment I have accepted for transport conform with the description on this manifest."		TRANSPORTER NO 1 VEHICLE ID NO S C X U 2131105119	DATE RECEIVED 11/22/83

TEAR AT THIS INFORMATION

RECEIVED 3/21/0

PART B

GEN EPA ID# V1D9B065109

TRANSPORTER NO 1 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment."	DATE DELIVERED 11/24/83
TRANSPORTER NO 2 SIGNATURE "To the best of my knowledge the contents of the shipment I have accepted for transport conform with the description on this manifest."	DATE RECEIVED 11/22/83
TRANSPORTER NO 2 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment."	
TREATMENT STORAGE OR DISPOSAL FACILITY INDICATION OF ANY DIFFERENCES BETWEEN MANIFEST AND SHIPMENT OR LISTING OF REASONS FOR AND DISPOSITION OF REJECTED MATERIALS	HAZARDING METHOD 5027
TREATMENT STORAGE OR DISPOSAL FACILITY SIGNATURE "Upon visual inspection, I certify that the contents of this shipment conform with the description on this manifest except those differences noted on this form."	DATE RECEIVED 11/24/83
In case of emergency or spill immediately call the Environmental Quality Board at 775-8997	

**COMMONWEALTH OF PUERTO RICO
ENVIRONMENTAL QUALITY BOARD
HAZARDOUS WASTE MANIFEST**

FROM: Island Chemical Co., Inc. (809) 770-2200		EPA ID NO. V1D98065107
TO: Estate 130 Estate Bethlehem, St. Croix, U.S. Virgin Islands Trailer Marine Transport Corporation (809) 721 1313		EPA ID NO. P1D98064457
TO: Isla Grande, Puerto Rico Transporte Diaz (809) 792-7999		EPA ID NO. P1D98052683
TO: Zona Portuaria, Puerto Nuevo, San Juan, Puerto Rico Island Chemical of P.R., Inc. (809) 854-1090		EPA ID NO. P1D09039271
Km. 51, Highway #2, Manati, Puerto Rico		

HAZARDOUS MATERIAL NAME	UN DOT HAZARD CLASS	UN NUMBER	QUANTITY	NET WEIGHT	HAZ	CONTAINERS		EPA ID NO.	HAZ CODE	FORM
						NO	TYPE			
Toluene 99	Flam. Liquid	1294	1	1511510	601	1	TK	1	1	1

Signature: <i>Jerome H. Ludwig</i> Name: Jerome H. Ludwig Title: President	DATE: 12-14-88 TIME: 12:31 PM LOCATION: SCXU	RECEIVED: 12-23-88 BY: 12-23-88
Signature: <i>[Signature]</i> Name: <i>[Name]</i> Title: <i>[Title]</i>		

PART B Signature: <i>[Signature]</i> Name: <i>[Name]</i> Title: <i>[Title]</i>	DATE: 12-22-88 TIME: 12:22 PM LOCATION: SC2

Medical Co., Inc.

(809) 771-2200

SITE ADDRESS 134 Estato Bethlehem, St. Croix, U.S. Virgin Islands	
TRANSPORTER NO 1 Marina Transport Corporation	PHONE (809) 721-1313
SITE ADDRESS P.R. 00980, Puerto Rico	
TRANSPORTER NO 2 Lo Diaz	PHONE (809) 792-7299
SITE ADDRESS Puerto Nuevo, San Juan, Puerto Rico	
TREATMENT STORAGE OR DISPOSAL (TSD) FACILITY Inland Chemical of P.R., Inc.	PHONE (809) 854-1100
SITE ADDRESS 21, Highway # 2, Manati, Puerto Rico	

V.I.D.9,8,0,6,1,0,0

P.R.D.9,0,0,0,4,5,7

P.R.D.9,0,0,5,2,0,3

P.R.D.9,0,0,3,2,2,7,1

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE

THIS FORM IS NO. 1 OF A TOTAL OF 1 THE FIRST MANIFEST DOCUMENT NO. IS

P. R.

I.C.D.3

PROPER US DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS		EGB EPA HAZ CODE	EGB/EPA WASTE TX
						NO	TYPE		
1. Toluene	Flam. Liquid	1204	L	147.63	Gal.	19	TK	1	Flam
2									
3									
4									
5									
6									

SPECIAL HANDLING INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A NONHAZARDOUS NATURE WHICH DO NOT HAVE TO BE MANIFESTED)

GENERATOR'S CERTIFICATION: This is to certify that the above named materials are properly classified, described, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation, U.S. EPA and the Commonwealth of P.R. The waste described above were consigned to the Transporter named. The Transporter, Storage or Disposal Facility can and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the foregoing is true and correct to the best of my knowledge.

GENERATOR'S SIGNATURE Jerome H. Ludwig	TITLE President	DATE SHIPPED 02/07/80	EXPECTED ARRIVAL DATE 02/07/80
TRANSPORTER NO. 1 SIGNATURE To the best of my knowledge the contents of the shipment I have accepted for transport conforms with the description on this manifest.	TRANSPORTER NO. 1 VEHICLE NO. NO SCXU 2310500	DATE RECEIVED 02/07/80	

TEAR AT THIS PERFORATION

PART B

GEN EPA ID#

V.I.D.9,8,0,6,1,0,0

TRANSPORTER NO. 1 SIGNATURE To the best of my knowledge the contents of the shipment I have accepted for transport conforms with the description on this manifest.	TRANSPORTER NO. 1 VEHICLE NO. NO SCXU 2310500	DATE RECEIVED 02/07/80
TRANSPORTER NO. 2 SIGNATURE To the best of my knowledge the contents of the shipment I have accepted for transport conforms with the description on this manifest.	TRANSPORTER NO. 2 VEHICLE NO. NO	DATE RECEIVED
TRANSPORTER NO. 3 SIGNATURE To the best of my knowledge the contents of the shipment I have accepted for transport conforms with the description on this manifest.	TRANSPORTER NO. 3 VEHICLE NO. NO	DATE RECEIVED

TREATMENT STORAGE OR DISPOSAL FACILITY INDICATION OF ANY DIFFERENCES BETWEEN MANIFEST AND SHIPMENT OR LISTING OF REASONS FOR REJECTION OF MATERIALS

HANDLING

1	5	0	2		
3				4	
5					6

TREATMENT STORAGE OR DISPOSAL FACILITY SIGNATURE
To the best of my knowledge the contents of this shipment conform with the description on this manifest except those discrepancies noted on this form.

DATE RECEIVED
02/22/80

In case of emergency, call the Environmental Quality Board (809)

DOCUMENT NO. 103 P. R.

100467

COMMONWEALTH OF MASSACHUSETTS
ENVIRONMENTAL QUALITY BOARD
HAZARDOUS WASTE MANIFEST

684.12.02

DOCUMENT NO.

P. R.

SHIPPER'S NAME <i>General Incorporated</i>	PHONE <i>617-77-2000</i>	EPA NO. (1)
SHIPPER'S ADDRESS <i>100 State Street, Boston, MA 02109</i>	PHONE <i>617-77-2000</i>	EPA NO. (2)
SHIPPER'S BUSINESS <i>General Incorporated</i>	PHONE <i>617-77-2000</i>	EPA NO. (3)
RECEIVING STORAGE OR DISPOSAL FACILITY NAME <i>Waste Management, Inc.</i>	PHONE <i>617-77-1000</i>	EPA NO. (4)
RECEIVING ADDRESS <i>100 State Street, Boston, MA 02109</i>	PHONE <i>617-77-1000</i>	EPA NO. (5)

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE

THIS FORM IS NO. <u>1</u> OF A TOTAL OF <u>1</u> THE FIRST MANIFEST DOCUMENT NO. IS <u>100468</u> P. R. <u>1</u>											
SHIPPER'S DOT SHIPPING NAME	DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS					
						NO	TYPE				

IF THE MANIFEST INDICATES INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A NORMAL HAZARDOUS WASTE WHICH DOES NOT HAVE TO BE MANIFESTED)

DECLARATION: This is to certify that the above named materials are properly classified, described, marked and labeled and are in proper condition for transportation in accordance with the regulations of the Department of Transportation, U.S. EPA and the Commonwealth of MA. The waste described above were consigned to the Transporter named below. Shipper or Receiver (facility) can and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the foregoing is true and correct to the best of my knowledge.

SIGNATURE	TITLE	DATE SIGNED	EXPIRATION DATE
TRANSPORTER NO. 1 SIGNATURE "To the best of my knowledge the contents of the shipment have been accepted for transport conforming with the description on this manifest"		TRANSPORTER NO. 1 VEHICLE NO.	DATE RECEIVED

YEAR AT THIS PERFORMANCE

SHIPPER'S SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment."	DATE SIGNED
TRANSPORTER NO. 2 SIGNATURE "To the best of my knowledge the contents of the shipment have been accepted for transport conforming with the description on this manifest"	TRANSPORTER NO. 2 VEHICLE NO.
TRANSPORTER NO. 2 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment."	DATE RECEIVED
RECEIVING STORAGE OR DISPOSAL FACILITY INDICATION OF ANY DIFFERENCES BETWEEN MANIFEST AND SHIPMENT OR LISTING OF REASONS FOR NON-DISPOSITION OF REJECTED MATERIALS	RECEIVED BY
100468	
RECEIVING STORAGE OR DISPOSAL FACILITY SIGNATURE "Upon visual inspection, I certify that the contents of this shipment conform with the description on this manifest except for the differences noted on this form."	DATE RECEIVED

In case of emergency or spill immediately call the Environmental Quality Board (800)

**COMMONWEALTH OF PUERTO RICO
ENVIRONMENTAL QUALITY BOARD
HAZARDOUS WASTE MANIFEST**

DOCUMENT NO.

P.R. IC02
EPA ID NO

Generator: Chemical Company, Incorporated		PHONE: (809) 778-2200	P.R. ID: 9,8,0,6,5,1,0,9,5
ADDRESS: State 130 Estate Bethlehem, St. Croix U.S. Virgin Islands			
Transporter NO 1: Trailer Marine Transport Corporation		PHONE: (809) 721-1313	P.R. ID: 9,8,0,6,4,4,5,7,9
SITE ADDRESS: Isla Grande, Puerto Rico			
Transporter NO 2: Transporte Diaz		PHONE: (809) 792-7999	P.R. ID: 9,8,0,5,2,6,8,3,4
SITE ADDRESS: Zona Portuaria, Puerto Nuevo, San Juan, Puerto Rico			
Treatment/Storage or Disposal (TSD) Facility: Inland Chemical of P.R., Inc.		PHONE: (809) 854-1090	P.R. ID: 0,9,0,3,9,9,7,1,8
SITE ADDRESS: Km. 51, Highway #2, Manati, Puerto Rico			

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE

THIS FORM IS NO. 1 OF A TOTAL OF 1 THE FIRST MANIFEST DOCUMENT NO IS P.R. IC 02

	PROPER US DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS		EPA HAZ CODE	EPA WASTE TYPE
							NO.	TYPE		
1	TOLUENE RQ	Flam. Liquid	1294	L	512.05	Gal.	1	TK	1	F101015
2										
3										
4										
5										
6										

SPECIAL HANDLING INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A NONHAZARDOUS NATURE WHICH DO NOT HAVE TO BE MANIFESTED)

GENERATOR'S CERTIFICATION: This is to certify that the above named materials are properly classified, described, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation, U.S. EPA and the Commonwealth of P.R. The waste described above were consigned to the Transporter named. The Treatment, Storage or Disposal Facility can and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the foregoing is true and correct to the best of my knowledge.

GENERATOR'S SIGNATURE: <i>Jerome H. Ludwig</i>	TITLE: President	DATE SHIPPED: 12/11/91	EXPECTED ARRIVAL DATE: 12/11/91
TRANSPORTER NO. 1 SIGNATURE: <i>[Signature]</i>	TRANSPORTER NO. 1 VEHICLE ID. NO: SCXU 1213110151191	DATE RECEIVED: 12/11/91	

YEAR AT THIS PERFORMANCE

PART B

GEN EPA ID: **VI 11019181016151101915**

TRANSPORTER	TRANSPORTER NO. 1 SIGNATURE: "I certify that I have not tampered with or materially altered the contents of this shipment."	DATE DELIVERED: 12/11/91						
	TRANSPORTER NO. 2 SIGNATURE: "To the best of my knowledge the contents of the shipment I have accepted for transport conforms with the description on this manifest."	DATE RECEIVED: 12/11/91						
	TRANSPORTER NO. 2 SIGNATURE: "I certify that I have not tampered with or materially altered the contents of this shipment."							
TSD FACILITY	TREATMENT STORAGE OR DISPOSAL FACILITY INDICATION OF ANY DIFFERENCES BETWEEN MANIFEST AND SHIPMENT OR LISTING OF REASONS FOR AND DISPOSITION OF REJECTED MATERIALS	HANDLING METHOD: <table border="1"><tr><td>1</td><td>2</td></tr><tr><td>3</td><td>4</td></tr><tr><td>5</td><td>6</td></tr></table>	1	2	3	4	5	6
	1	2						
3	4							
5	6							
TREATMENT STORAGE OR DISPOSAL FACILITY SIGNATURE: "Upon visual inspection I certify that the contents of this shipment conform with the description on this manifest except those discrepancies noted on this form."		DATE RECEIVED: 12/11/91						

In case of emergency or spill immediately call the Environmental Quality Board (809) 725-8892

DOCUMENT NO.

P.R.

ENVIRONMENTAL QUALITY BOARD
HAZARDOUS WASTE MANIFEST

ART A:

DOCUMENT NO 1001 P. R

GENERATOR NAME Island Chemical Company, Incorporated	PHONE (809) 778-2500	EPA ID NO 73D980631001
SITE ADDRESS Route 190 Pataca Settlement, St. Cruz U.S. Virgin Islands		
TRANSPORTER NO 1 Triller Marine Transport Corporation	PHONE (809) 728-1111	EPA ID NO 73D980631001
SITE ADDRESS Isla Grande, Puerto Rico		
TRANSPORTER NO 2 Transporte Diaz	PHONE (809) 707-7999	EPA ID NO 73D980631001
SITE ADDRESS Zona Portuaria, Puerto Ricos, San Juan, Puerto Rico		
TREATMENT, STORAGE OR DISPOSAL (TSD) FACILITY Island Chemical of P.R., Inc.	PHONE (809) 854-8070	EPA ID NO 73D980631001
SITE ADDRESS Rm. 51, Highway #2, Pataca, Puerto Rico		

IF MORE THAN TWO TRANSPORTERS ARE TO BE UTILIZED, FILL OUT THE FOLLOWING AS APPROPRIATE

THIS FORM IS NO _____ OF A TOTAL OF _____ THE FIRST MANIFEST DOCUMENT NO IS _____ P. R.

PROPER US DOT SHIPPING NAME	US DOT HAZARD CLASS	UN NUMBER	FORM	NET QUANTITY	UNITS	CONTAINERS		EGB EPA HAZ CODE	EGB/EPA WASTE TYPE
						NO	TYPE		
1 Toluene 50	Flam. Liquid	1204	L	5,195	Gal.	1	YF	1	P201
2									
3									
4									
5									
6									

SPECIAL HANDLING INSTRUCTIONS INCLUDING CONTAINER EXEMPTION (i.e. IDENTIFICATION OF ADDITIONAL WASTES INCLUDED IN SHIPMENT OF A NONHAZARDOUS NATURE WHICH DO NOT HAVE TO BE MANIFESTED)

GENERATOR'S CERTIFICATION: I hereby certify that the above named materials are properly classified, described, marked and labeled and are in proper condition for transportation according to the requirements of the Department of Transportation, U.S. EPA and the Commonwealth of P.R. The waste described above were consigned to the Transporter named The Triller Marine Transport Corporation and will accept the shipment of hazardous waste, and has a valid permit to do so. I certify that the foregoing is true and correct to the best of my knowledge.

TITLE President	DATE SHIPPED MO DAY YR 11 15 82	EXPECTED ARRIVAL DATE MO DAY YR 11 15 82
TRANSPORTER NO. 1 VEHICLE ID NO 2310303	DATE RECEIVED MO DAY YR 11 15 82	

YEAR AT THIS PERFORMANCE

CHP-31156

PART B

GEN EPA ID

73D980631001

TRANSPORTER NO 1 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment"	DATE DELIVERED MO DAY YR 11 15 82
TRANSPORTER NO 2 SIGNATURE "To the best of my knowledge the contents of the shipment I have accepted for transport conform with the description on this manifest"	DATE RECEIVED MO DAY YR 11 15 82
TRANSPORTER NO 2 SIGNATURE "I certify that I have not tampered with or materially altered the contents of this shipment"	
TREATMENT STORAGE OR DISPOSAL FACILITY INDICATION OF ANY DIFFERENCES BETWEEN MANIFEST AND SHIPMENT OR LISTING OF REASONS FOR AND DISPOSITION OF REJECTED MATERIALS	HANDLING METHOD 1 2 3 4 5 6
TREATMENT STORAGE OR DISPOSAL FACILITY SIGNATURE "Upon visual inspection, I certify that the contents of this shipment conform with the description on this manifest except those discrepancies noted on this form"	DATE RECEIVED MO DAY YR 11 15 82

In case of emergency or spill, immediately call the Environmental Quality Board (809) 725-8992

DOCUMENT NO 1001 P. R

PHOTOGRAPHS

Berlex Laboratories

St. Croix. VI

September 9, 1985

PHOTOGRAPHS



Photo #1 - Aboveground raw material storage tanks. Berlex, VI

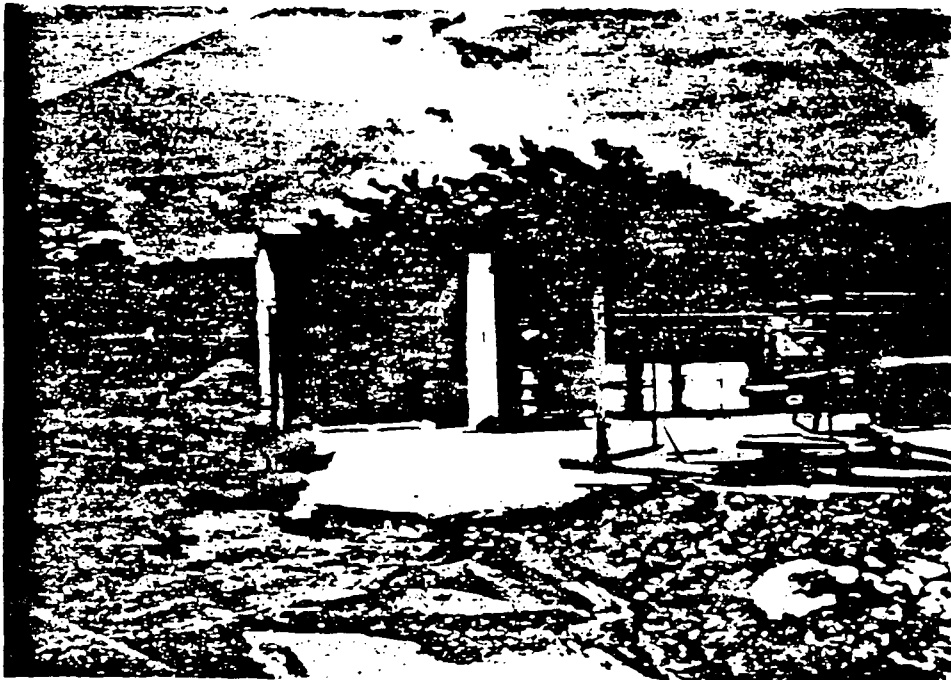


Photo #2 - Outside material storage area. Berlex, VI

PHOTOGRAPHS

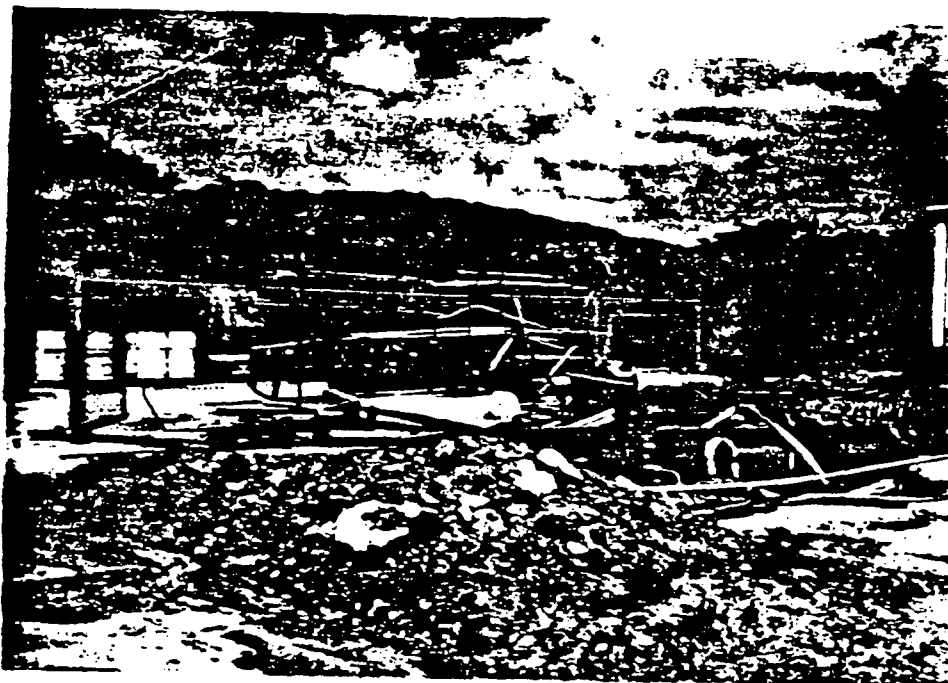


Photo #3 - Outside material storage area. Berlex, VI



Photo #4 - Location of toluene drying oven. Berlex, VI

100473

PHOTOGRAPHS



Photo #5 - Entrance to toluene drying oven. Berlex, VI

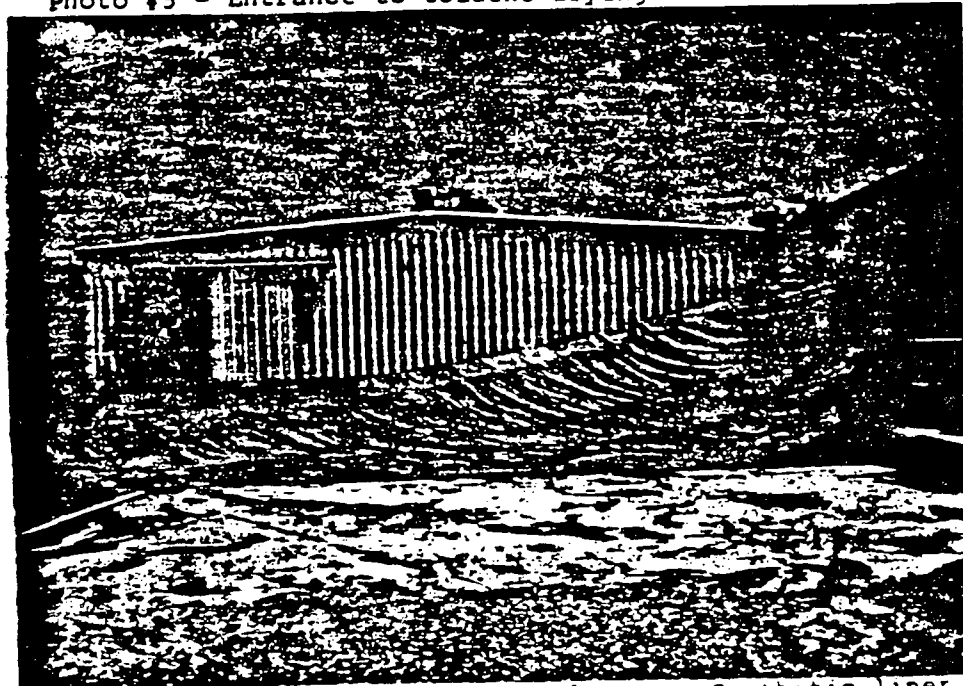


Photo #6 - pyridine contaminated Area. Synthetic liner used to prevent saturation of soil. Berlex, VI

PHOTOGRAPHS



Photo #7 & #8 - Pyridine contaminated area. Lab waste drainage area, surface sampling using trowels. Berlex, VI



PHOTOGRAPHS

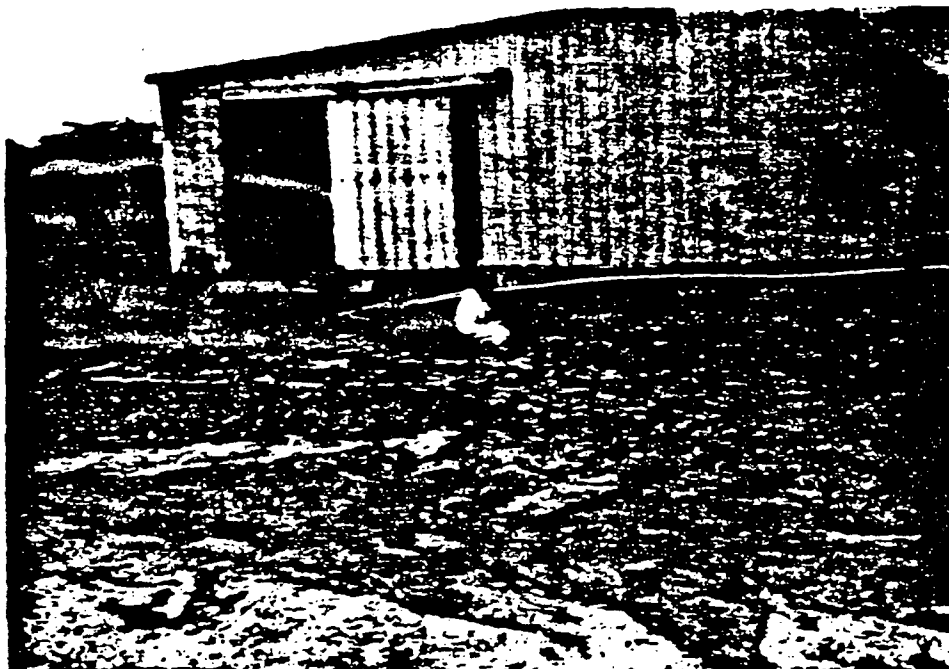


Photo #9 - Pyridine contaminated area. Lab waste drainage area, surface sampling using trowels. Berlex, VI



Photo #10 - Pyridine contaminated area. Lab waste drainage area, subsurface sampling using bucket augers. Berlex, VI

PHOTOGRAPHS

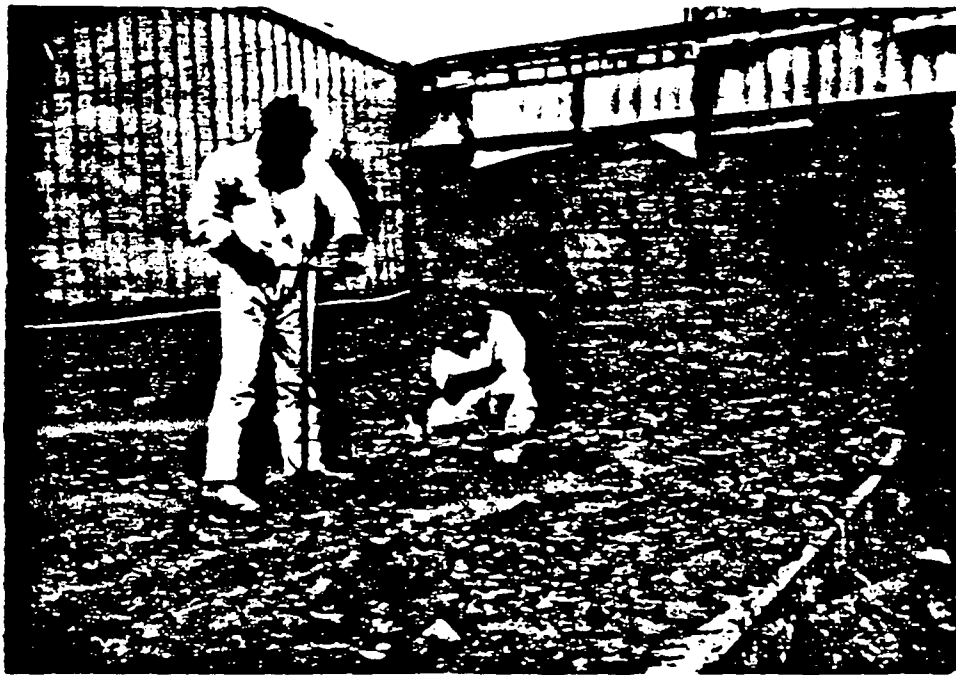


Photo #11 - Pyridine contaminated area. Lab waste drainage area, subsurface sampling using bucket augers. Berlex, VI

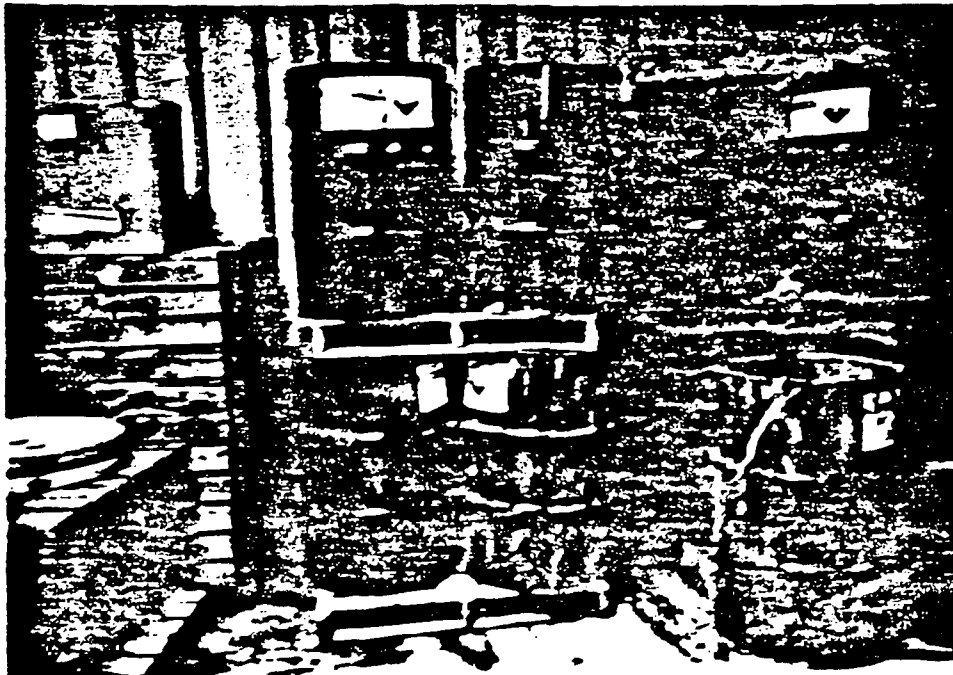


Photo #12 - 55-gallon drums of toluene contaminated soil in warehouse. Berlex, VI

PHOTOGRAPHS

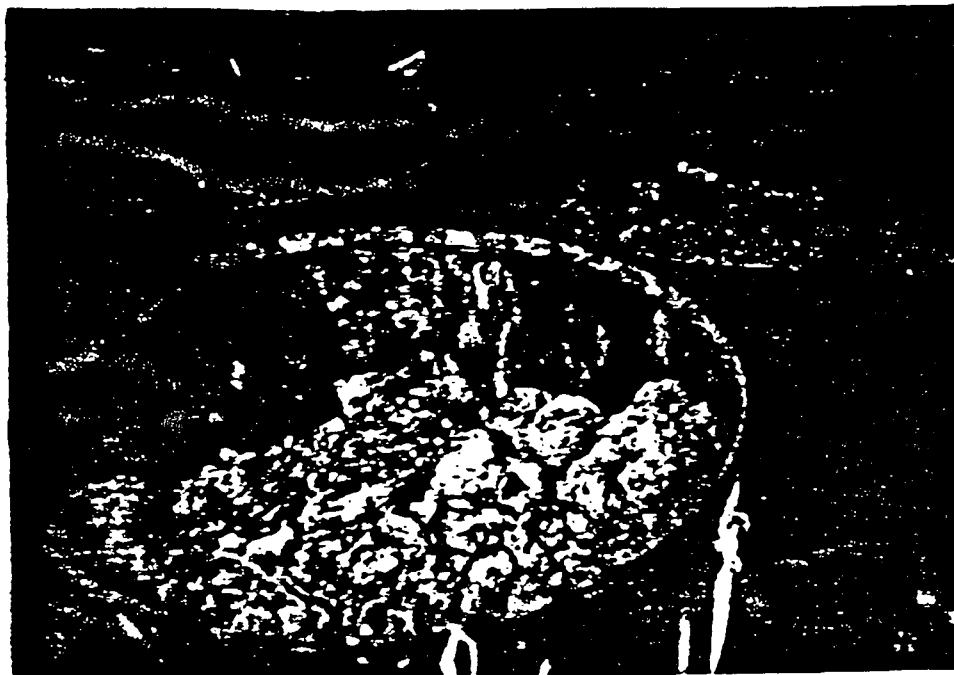


photo #13 - Close-up view of toluene contaminated soil stored in warehouse. Berlex, VI

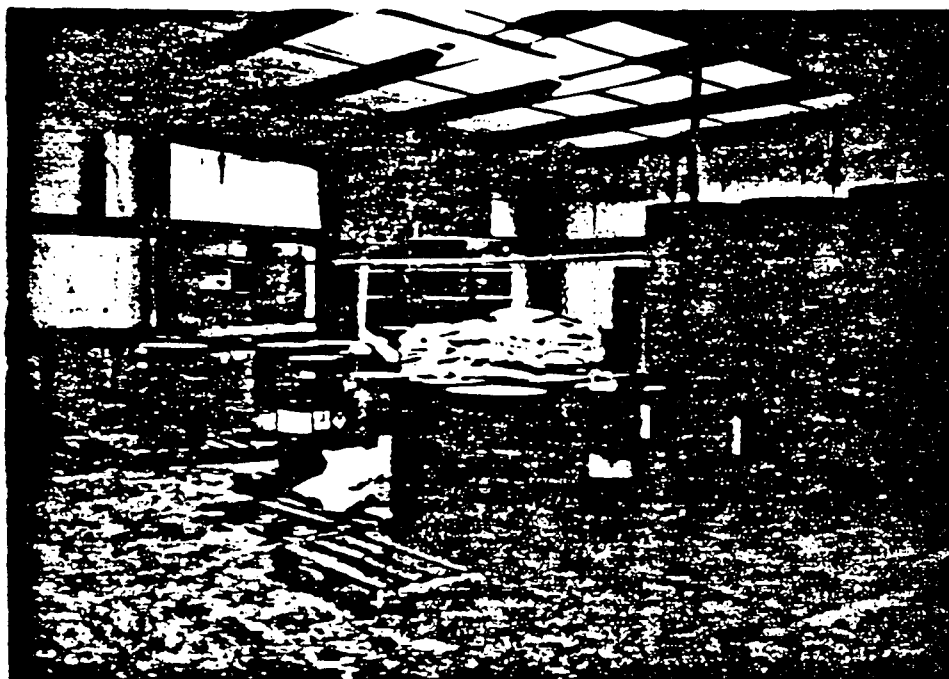


Photo #14 - 55-gallon drums of raw materials stored in warehouse. Berlex, VI

Attachment 2:

Hazardous waste manifests

Berlex Laboratories (ICC)
VID980651095

March 13, 1986



HAZARDOUS WASTE MANIFEST

(As Required By The Alabama Department of Environmental Management)

Please print or type (Form designed for use on elite (12-pitch) typewriter)

Form Approved OMB No 2000-0404 Expires 7-31-85

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No. V1098065109510003	Manifest Document No. 10003	2. Page 1 of 2	Information in the shaded areas is not required by Federal law
3. Generator's Name and Mailing Address ISLAND CHEMICAL COMPANY 300 FAIRFIELD ROAD WAYNE, NEW JERSEY 07090		Trailer Number TMTZ 680365		A. State Manifest Document Number CWMA 243032	
4. Generator's Phone (201) 698-8100				B. State Generator's ID	
5. Transporter 1 Company Name ONEALE TRUCKING AND TRAILER TRANSPORT, INC.		6. US EPA ID Number PRD980682579		C. State Transporter's ID	
7. Transporter 2 Company Name TRAILER MARINE TRANSPORT, INC.		8. US EPA ID Number PRD980682579		D. Transporter's Phone 404-452-1447	
9. Designated Facility Name and Site Address CHEMICAL WASTE MANAGEMENT, INC. Emelle Facility Alabama Highway 17 at Mile Marker 163 Emelle, Alabama 35459		10. US EPA ID Number ALD000622464		E. State Facility's ID	
				F. Facility's Phone 205/652-9721	
11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)		12. Containers No. Type	13. Total Quantity	14. Unit Wt/Vol	15. Waste No.
a. HAZARDOUS WASTE LIQUID NOS (Toluene & Benzene) ORM-E NA9189 CWM Profile Number ALAD 48602		12 DM			
b. HAZARDOUS WASTE LIQUID NOS (Toluene & Chloroform) ORM-E NA9189 CWM Profile Number ALAD 48603		10 DM			
c. HAZARDOUS WASTE SOLID NOS (METAL DRUMS) ORM-E NA9189 CWM Profile Number ALAE 68804		14 DM			
d. CWM Profile Number					
16. Additional Descriptions for Materials Listed Above 11a. Less than 1.0% Toluene and Benzene 11b. Approximately 20% organic, primarily Benzyl acetate 11c. Drums contain pieces of metal drums w/ Voids		K. Handling Codes for Wastes Listed Above a. DBI c. DBI b. DBI d.			
15. Special Handling Instructions and Additional Information 11c. Drums will have to be filled with inert material by CWSMA					
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations. Unless I am a small quantity generator who has been exempted by statute or regulation from the duty to make a waste minimization certification under Section 3002(b) of RCRA, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment.					
Printed/Typed Name ALAN L. KYLES		Signature Alan L. Kyles		Month Day Year 11/01/85	
17. Transporter 1 Acknowledgement of Receipt of Materials Printed/Typed Name Oneale's Transport Inc Norton C. M. Burt		Signature Norton C. M. Burt		Month Day Year 11/01/85	
18. Transporter 2 Acknowledgement of Receipt of Materials Printed/Typed Name Shonda Berry		Signature Shonda Berry		Month Day Year 11/02/85	
19. Discrepancy Indication Space 100480					
20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19. Printed/Typed Name HOWARD TOMPHE					
Signature Howard Tomphey		Month Day Year 11/20/85			

**UNIFORM HAZARDOUS
WASTE MANIFEST
(Continuation Sheet)**

21. Generator's US EPA ID No

Manifest
Document No

22. Page

Information in the shaded areas
is not required by Federal
law

V 1 0 9 8 0 6 5 1 0 9 5

IC003

2 of 2

3. Generator's Name

ISLAND CHEMICAL COMPANY
300 PARKFIELD ROAD
WARRING, NEW JERSEY 07070
TEL 201-694-4100

Trailer Number
TMTZ 680365

L. State Manifest Document Number

CWMA 273032

M. State Generator's ID

24. Transporter's Company Name

RANGER NATIONAL INC

25. US EPA ID Number

FLD 980803977

N. State Transporter's ID

O. Transporter's Phone

26. Transporter's Company Name

RYDER RANGER

27. US EPA ID Number

FLD 007022578

P. State Transporter's ID

Q. Transporter's Phone 318-439-6249

28. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)

29. Containers	30. Total Quantity	31. Unit Wt/Vol	R. Waste No.
No.	Type		
a.	12	DM	
b.	10	DM	
c.	14	DM	
d.			
e.			
f.			
g.			
h.			
i.			

a. HAZARDOUS WASTE LIQUID NOS (Toluene & Benzene)

ORR-E NA9189

CWM Profile Number ALAD 48603

b. HAZARDOUS WASTE LIQUID NOS (Toluene & Benzene)

ORR-E NA9189

CWM Profile Number ALAD 48603

c. HAZARDOUS WASTE SOLID NOS (Metal Drums)

ORR-E NA9189

CWM Profile Number ALAE 68804

CWM Profile Number

ORR

CWM Profile Number

12/3

CWM Profile Number

CWM Profile Number

CWM Profile Number

CWM Profile Number

6. Additional Descriptions for Materials Listed Above

28a. Less than 1.0% Toluene & Benzene

28b. Approximately 80% organic, primarily benzene acetate

28c. Drums contain pieces of metal drum n/p/wid

T. Handling Codes for Wastes Listed Above

a. d. g.
b. e. h.
c. f. i.

32. Special Handling Instructions and Additional Information

28c. Drums will have to be filled with inert material by CWM.

33. Transporter Acknowledgement of Receipt of Materials

Date

Printed/Typed Name
Norton C. M. Burr Jr.

Signature

Norton C. M. Burr Jr.

Month Day Year

10/17/85

34. Transporter Acknowledgement of Receipt of Materials

Date

Printed/Typed Name

GESSE DAILEY JR

Signature

Gesse Dailey

Month Day Year

1/4/88

35. Discrepancy Indication Space

100481



HAZARDOUS WASTE MANIFEST

(As Required By The Alabama Department of Environmental Management)

Base print or type. (Form designed for use on 12-pitch typewriter.)

Form Approved OMB No 2000-0404 Expires 7-31-85

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No V109806510951C001		Manifest Document No 001		2. Page 1 of 2		Information in the shaded areas is not required by Federal law.	
3. Generator's Name and Mailing Address ISLAND CHEMICAL COMPANY 800 FAIRFIELD ROAD WAYNE NEW JERSEY 07470				Trailer Number RTM2;274676				A. State Manifest Document Number CWMA 243033	
4. Generator's Phone (201) 696-4100								B. State Generator's ID	
5. Transporter 1 Company Name O'NEALE'S TRUCKING & TRAILER TRANSPORT, INC.				6. US EPA ID Number PRD980642579				C. State Transporter's ID	
7. Transporter 2 Company Name TRAKA MARINE TRANSPORT, INC.				8. US EPA ID Number PRD980642579				D. Transporter's Phone	
9. Designated Facility Name and Site Address CHEMICAL WASTE MANAGEMENT, INC. Emelle Facility Alabama Highway 17 at Mile Marker 163 Emelle, Alabama 35459				10. US EPA ID Number ALD000622464				E. State Transporter's ID	
								F. Transporter's Phone	
								G. State Facility's ID	
								H. Facility's Phone 205/652-9721	
11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)						12. Containers		13. Total Quantity	
						No. Type		Unit Wt/Vol	
a. HAZARDOUS WASTE SOLID NOS (TOLUENE & ACETONE) ORM-E NA 9189						15 DM			
b. HAZARDOUS WASTE SOLID NOS (TOLUENE & CHLOROFORM) ORM-E NA 9189						23 DM			
c. HAZARDOUS WASTE LIQUID NOS (TOLUENE & BENZENE) ORM-E NA 9189						38 DM			
d. CWM Profile Number									
J. Additional Descriptions for Materials Listed Above Na. less than 1.0% Toluene and Acetone Nb. less than 1.0% Toluene and Chloroform Nc. less than 1.0% Toluene and Benzene NOS SLIGHT ODOR OF BENZYL ACETATE						K. Handling Codes for Wastes Listed Above a.DBI c.DBI b.DBI d.			
15. Special Handling Instructions and Additional Information NONE / ITEMS 11a, 11b, 11c. SOLID. MUST BE INSPECTED BY UNCL-PPD PRIOR TO DEPARTURE FROM ST. CROIX. PERMIT TAKEN									
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations. Unless I am a small quantity generator who has been exempted by statute or regulation from the duty to make a waste minimization certification under Section 3002(b) of RCRA, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment.									
Printed/Typed Name ALAN L. KYLES				Signature <i>Alan L. Kyles</i>				Month Day Year 10/09/85	
17. Transporter 1 Acknowledgement of Receipt of Materials				Signature <i>Norton C.M. Burt</i>				Month Day Year 11/01/85	
Printed/Typed Name O'Neale's Transport Inc Norton C.M. Burt									
18. Transporter 2 Acknowledgement of Receipt of Materials				Signature <i>Glenda Henry</i>				Month Day Year 11/02/85	
Printed/Typed Name Glenda Henry									
19. Discrepancy Indication Space 123									
20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.									
Printed/Typed Name HOWARD TEMPE				Signature <i>Howard Tempe</i>				Month Day Year 11/20/85	

**UNIFORM HAZARDOUS
WASTE MANIFEST
(Continuation Sheet)**

21. Generator's US EPA ID No

Manifest
Document No

22. Page

Information in the shaded areas
is not required by Federal
law

V10980651095 IC001

2 of 2

23. Generator's Name

ISLAND CHEMICAL COMPANY
300 FAIRFIELD ROAD 07870
WAYNE, NEW JERSEY

Trailer Number
RTM2; 274676

TEL 201-692 8100

L. State Manifest Document Number

CWMA 243033

M. State Generator's ID

24. Transporter's Company Name

RANGER NATIONAL

25. US EPA ID Number

FL0980803977

N. State Transporter's ID

O. Transporter's Phone

26. Transporter's Company Name

RYDER RANGER

27. US EPA ID Number

FL00022572

P. State Transporter's ID

Q. Transporter's Phone 318-439-6249

28. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)

29. Containers

30. Total
Quantity

31. Unit
M/Vol

32. R.
Waste No.

a. ~~HAZARDOUS WASTE SOLID AQS (TOLUENE & BENZENE)~~

ORM-E NA 9119

CWM Profile Number ALA66023

15 DM

b. ~~HAZARDOUS WASTE SOLID AQS (TOLUENE & BENZENE)~~

ORM-E NA 9119

CWM Profile Number ALA091004

23 DM

c. ~~HAZARDOUS WASTE LIQUID AQS (TOLUENE & BENZENE)~~

ORM-E NA 9119

CWM Profile Number ALA6602

34 DM

d. CWM Profile Number

CR 10/3

e. CWM Profile Number

f. CWM Profile Number

g. CWM Profile Number

h. CWM Profile Number

i. CWM Profile Number

5. Additional Descriptions for Materials Listed Above

~~Ab. less than 10% Toluene and Benzene~~
~~Ab. less than 10% Toluene and Chlorobenzene~~
~~Ab. less than 10% Toluene and Benzene~~
~~SWIFT ROAD OF BANGOR ACADEMY~~

T. Handling Codes for Wastes Listed Above

a. d. g.
b. e. h.
c. f. i.

32. Special Handling Instructions and Additional Information

SEE PERMIT ON ITEMS 11a & 11b. MUST BE INSPECTED BY USOP-PPQ PRIOR
TO DEPARTURE FROM ST. CROIX PERMIT INCLUDED

Alan Kipley 1/4/85

33. Transporter Acknowledgement of Receipt of Materials

Date

Printed/Typed Name
O'Neale's Transport Inc
Norton C. M. Burr

Signature

Norton C. M. Burr

Month Day Year
1 0 1 7 8 5

34. Transporter Acknowledgement of Receipt of Materials

Date

Printed/Typed Name
DANIEL R LOUET

Signature

Daniel R. Louet

Month Day Year
1 1 2 1 8 5

35. Discrepancy Indication Space

100483



HAZARDOUS WASTE MANIFEST

(As Required By The Alabama Department of Environmental Management)

Please print or type

(Form designed for use on elite (12-pitch) typewriter.)

Form Approved OMB No 2000-0404 Expires 7-31-86

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 2	Information in the shaded areas is not required by Federal law	
3. Generator's Name and Mailing Address ISLAND CHEMICAL COMPANY 300 FAIRFELD ROAD WAYNE NEW JERSEY 07090		Trailer Number RTMZ 251880		A. State Manifest Document Number CWMA-243031		
4. Generator's Phone (201) 698-4100				B. State Generator's ID		
5. Transporter 1 Company Name O'NEALE'S TRUCKING & TRAILER TRANSPORT, INC.		6. US EPA ID Number PR0980642579		C. State Transporter's ID		
7. Transporter 2 Company Name TRACEL MARINE TRANSPORT INC.		8. US EPA ID Number PR0980642579		D. Transporter's Phone		
9. Designated Facility Name and Site Address CHEMICAL WASTE MANAGEMENT, INC. Emelle Facility Alabama Highway 17 at Mile Marker 163 Emelle, Alabama 35459		10. US EPA ID Number ALD000622464		E. State Transporter's ID		
				F. Transporter's Phone		
				G. State Facility's ID		
				H. Facility's Phone 205/652-9721		
11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)		12. Containers		13. Total Quantity	14. Unit Wt/Vol	L. Waste No.
a. HAZARDOUS WASTE LIQUID NOS (TOLUENE & BENZENE) ORM-E NA 9189 CWM Profile Number ALAD 98602		No. Type				
b. HAZARDOUS WASTE LIQUID NOS (TOLUENE & CHLOROFORM) ORM-E NA 9189 CWM Profile Number ALAD 98603		44 DM				
c. HAZARDOUS WASTE SOLID NOS (TOLUENE & CHLOROFORM) ORM-E NA 9189 CWM Profile Number ALAD 41604		35 DM				
d. CWM Profile Number		1 DM				
J. Additional Descriptions for Materials Listed Above NA. LESS THAN 1.0% TOLUENE AND BENZENE SUBST. ODR OF BENEYL ACETATE 11B. APPROXIMATELY 20% XEROX, PRIMARY BENEYL ACETATE 11C. LESS THAN 1.0% TOLUENE AND BENZENE CHLOROFORM		K. Handling Codes for Wastes Listed Above DS1 DS1 DS1 d.				
15. Special Handling Instructions and Additional Information 11C. Soil present in these drums. Must be inspected by USDA-PPS Prior to departure from Ft. Davis. Permit Included.						
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations. Unless I am a small quantity generator who has been exempted by statute or regulation from the duty to make a waste minimization certification under Section 3002(b) of RCRA, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment.						
Printed/Typed Name Alan L. Kyles		Signature Alan L. Kyles		Month Day Year 11/01/85		
17. Transporter 1 Acknowledgement of Receipt of Materials						
Printed/Typed Name O'Neale's Transport Inc Norton C M Burr		Signature Norton C M Burr		Month Day Year 11/01/85		
18. Transporter 2 Acknowledgement of Receipt of Materials						
Printed/Typed Name HELEN HEURLY		Signature Helen Heurly		Month Day Year 11/01/85		
19. Discrepancy Indication Space 12/3 100484						
20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.						
Printed/Typed Name HOWARD TEMPLER		Signature Howard Temple		Month Day Year 11/20/85		

UNIFORM HAZARDOUS WASTE MANIFEST (Continuation Sheet)		21. Generator's US EPA ID No. V10980651095	Manifest Document No.	22. Page 2 of 2	Information in the shaded areas is not required by Federal law
23. Generator's Name ISLAND CHEMICAL COMPANY 300 FAIRFIELD ROAD 07070 WAYNE, NEW JERSEY 07090 201/694-4100		Trailer Number RTMZ 251880		L. State Manifest Document Number CWMA 243031	
24. Transporter Company Name RENDER NATIONWIDE		25. US EPA ID Number FL0980803977		N. State Transporter's ID	
26. Transporter Company Name RYDER RANGER		27. US EPA ID Number FL0980803977		P. State Transporter's ID	
28. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)		29. Containers No. Type		30. Total Quantity 31. Unit R. Waste No.	
a. ~~HAZARDOUS WASTE LIQUID NOS (TOLUENE & BENZENE)~~ ORATE NO 9189 CWM Profile Number ALAD 98602		44 DM			
b. ~~HAZARDOUS WASTE LIQUID NOS (TOLUENE & CHLORFORM)~~ ORATE NO 9189 CWM Profile Number ALAD 98603		35 DM			
c. ~~Hazardous Waste Solid NOS (Toluene & Chloroform)~~ ORATE NO 9189 CWM Profile Number ALAD 98602		1 DM			
d. _____ CWM Profile Number		e. _____ CWM Profile Number		f. _____ CWM Profile Number	
g. _____ CWM Profile Number		h. _____ CWM Profile Number		i. _____ CWM Profile Number	
S. Additional Descriptions for Materials Listed Above 28a. less than 1% Toluene and Benzene 28b. Approximately 20% organic primarily Rongfl Acetate 28c. less than 1% Toluene & Chloroform		T. Handling Codes for Wastes Listed Above a. d. g. b. e. h. c. f. i.			
32. Special Handling Instructions and Additional Information 28c. See permit in these drums. Must be registered by MSDA-PPC prior to departure from St. Louis. Permit included.					
33. Transporter Acknowledgement of Receipt of Materials Printed/Typed Name Omeale's Transport Inc Signature Norton C. M. Buff					Date 10/17/85
34. Transporter Acknowledgement or Receipt of Materials Printed/Typed Name Charles M. Duhon Signature Charles M. Duhon					Date 12/2/86
35. Discrepancy Indication Space					

Attachment 3:

Copies of chain of custody and sampling paperwork

Berlex Laboratories (ICC)
VID980651095

March 13, 1986

CHAIN OF CUSTODY RECORD

Receipt for samples

ENVIRONMENTAL PROTECTION AGENCY - REGION II

SURVEILLANCE & ANALYSIS DIVISION

EDISON, NEW JERSEY 08817

VID980651095

Name of Unit and Address:		Berlex Laboratories St. Croix, Virgin Islands			
Sample Number	Number of Containers	Description of Samples			
085251 085252 085253 085254 085255	Samples split w/ facility	2 40 ml. vials for POA analysis 1 quart glass jar for NVOA analysis 1 quart glass jar for PCB analysis 1 quart glass jar for metals scan analysis The above samples were taken at the following locations: Gut #1 (Background) Gut #2 (Lab pit stepage area) Gut #3 (Drainage line entry), Lab waste pit #1 (composite of pit soil to 3 ft.), Lab waste pit (composite of pit soil to 3 ft.)			
085256		2 40 ml. vials for POA analysis 2 liter glass jars for NVOA analysis 1 liter glass jar for PCB analysis 1 gallon cubitainer for metals scan analysis The above sample was taken from the on-site well.			
Person Assuming Responsibility for Sample: Representative for Index (Island Chemical Co) <i>Alan L. Kyles</i> <i>Jan 1986</i>					
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
SURVEILLANCE & ANALYSIS DIVISION
EDISON, NEW JERSEY 08817

Name of Unit and Address:

Berlex Laboratories
St. Louis, MO

VIDEOTECH 95

Sample Number	Number of Containers	Description of Samples
65-51	2	40 ml. vials for POA analysis
	1	1 liter glass bottle for NUCIA analysis
	1	1 liter glass bottle for PCB analysis
	1	quart bottle for for metals analysis
65-52	2	40 ml. vials for POA analysis
	2	1 liter glass bottle for NUCIA analysis
	1	1 liter glass bottle for PCB analysis
	1	gallon container for metals analysis

Person Assuming Responsibility for Sample:

Carol Bruce

Time Date

5:00 3/1

Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody
65-51	Carol Bruce				Transfer to Lab
65-52	Carol Bruce	J. J. [unclear]	8:30 4/1	3/15/80	Transfer to OSCAR

Page No.

100488

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

Project Name: Exter Laboratories, St. Croix, VI
 Collector(s): P. Price Affiliation: U.S.E.P.A.

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
 Niskin Net Seine Trawl Bucket
 Trowel Cream Dipper
 Automatic
 Other _____

LDMS CODE M

DATA BASE CODE H

STA. TYPE CODE F

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
 Solvent Extract Other ()

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container: Glass Jar
Plastic Jar
Metal
POA Vial
 Cubitainer
 Acetate Core
Paper Cap
Teflon Cap
 Foli Cap
 Other _____
 Preservation
 Acid _____
 Solvent _____
 Chemical
Wet Ice
 Dry Ice
 Ambient
 Other _____

Cleaning Procedure

Detergent Wash
Water Rinse
Acid Rinse
 Solvent Rinse:
Acetone
Hexane
Methylene Chloride
 Other (Specify): _____

Sample Source Type (Circle)

Landfill Industrial
 Leachate Effluent
 Drum Process Stream
 Test Well Holding Pond
 Depth: Drum
 Other: Waste Pile
 Municipal Treatment
 Storage Tank Influent
 Top Effluent-CI
 Middle Effluent-Non CI
 Bottom Sludge
 Truck Ambient
 Drum Lake
 Tank Stream
 Other Pond
 Wells Ocean
 Monitoring Estuary
 Production
 Drinking
 Private

Samples to:

Bact Bio Chem Other

Station No.

VID980651095

Sample Depth (Fl./Fac. Loc. Code)

3100

Lab Number

085251

Type of Sample

Grab Time Composite
✓ Space

Collection (Ending) Date

8 Yr 6 Mo 3 Day

Ending Time (24 Hr)

1318

Beginning Date

Yr Mo Day

Beginning Time (24 Hr)

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☒ Yes ☐ No

If Yes With Whom? Facility Contractor

Receipt ☒ Yes ☐ No

Sample Location Description:

Background sample from stream (gut)
behind Exter property

Remarks:

2 - 40 ml. vials for POA analysis
1 - quart glass jar for NVOA analysis
1 - quart glass jar for PCB analysis
1 - quart glass jar for metals analysis
Water sample is a compound of interest
all samples rec'd

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey
ENVIRONMENTAL SERVICES DIVISION

Project Name Berlex Laboratories, St. Croix VI
Collector(s) Price Affiliation USEPA

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowel Cream Dipper
Automatic
Other _____

LDMS CODE M
DATA BASE CODE H
STA. TYPE CODE F

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
Solvent Extract Other ()

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container
Glass Jar
Plastic Jar
Metal
POA Vial
Cubitainer
Acetate Core
Paper Cap
Teflon Cap
Foil Cap
Other _____

Cleaning Procedure
Detergent Wash
Water Rinse
Acid Rinse
Solvent Rinse:
Acetone
Hexane
Methylene Chloride
Other (Specify): _____

Sample Source Type (Circle)

Landfill
Leachate
Drum
Test Well
Depth: _____
Other: _____
Storage Tank
Top
Middle
Bottom
Truck
Drum
Tank
Other: _____
Wells
Monitoring
Production
Drinking
Private

Industrial
Effluent
Process Stream
Holding Pond
Drum
Waste Pile
Municipal Treatment
Influent
Effluent-CI
Effluent-Non CI
Sludge
Ambient
Lake
Stream
Pond
Ocean
Estuary

Preservation

Acid _____
Solvent _____
Chemical _____
Wet Ice
Dry Ice
Ambient
Other _____

Sample Location Description:

Sample from stream (gut) behind plant
(lab waste pit seepage area)
Surface to 10"

Remarks:

2- 40 ml vials for VOA analysis
1- quart glass jar for NVOA analysis
1- quart glass jar for PCB analysis
1- quart glass jar for metals analysis
* Note: For one is a compound of specific interest
All samples used

Samples to:

Bact Bio Chem ☒ Other

Station No.

UID980651095

Sample Depth (Ft.)/Fac. Loc. Code

3101

Lab Number

085252

Type of Sample

Grab ☒ Composite
Time Space

Collection (Ending) Date

Yr 86 Mo 03 Day 13

Ending Time (24 Hr)

1345

Beginning Date

Yr Mo Day

Beginning Time (24 Hr)

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☒ Yes ☐ No

If Yes With Whom? Facility

Receipt ☒ Yes ☐ No

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

Project Name Berlex Laboratories, SI Creek VI
Collector(s) P. re Affiliation U.S.E.P.A.

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowel Cream Dipper
Automatic
Other

LDMS CODE M
DATA BASE CODE H
STA. TYPE CODE F

SUBSTRATE TYPE (Circle) Aqueous Sediment Sludge Oil Biological
Solvent Extract Other ()

BOD - Seed Supplied ☐ Yes ☐ No Source:

Sample Preparation (Circle)

Container Cleaning Procedure
Glass Jar Detergent Wash
Plastic Jar Water Rinse
Metal Acid Rinse
POA Vial Solvent Rinse:
Cubittainer Acetone
Acetate Core Hexane
Paper Cap Methylene Chloride
Teflon Cap Other (Specify):
Foil Cap
Other

Preservation

Acid
Solvent
Chemical
Wet Ice
Dry Ice
Ambient
Other

Sample Source Type (Circle)

Landfill Industrial
Leachate Effluent
Drum Process Stream
Test Well Holding Pond
Depth: Drum
Other: Waste Pile
Municipal Treatment
Storage Tank Influent
Top Effluent-CI
Middle Effluent-Non CI
Bottom Sludge
Truck Ambient
Drum Lake
Tank Stream
Other Pond
Ocean
Wells Estuary
Monitoring
Production
Drinking
Private

Samples to:

Bact Bio Chem ☒ Other

Station No.

VI D980651095

Sample Depth (Ft.)/Fac. Loc. Code

3102

Lab Number

085253

Type of Sample

Grab Composite
☒ Time Space

Collection (Ending) Date

Yr Mo Day
8 6 0 3 1 3

Ending Time (24 Hr)

1420

Beginning Date

Yr Mo Day

Beginning Time (24 Hr)

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☒ Yes ☐ No

If Yes With Whom? Facility, contract

Receipt ☒ Yes ☐ No

Sample Location Description:

Sample from stream (cut) behind plants
drainage line discharge area

Surface to approx. 10 inches

Remarks:

2 - 40 ml. vials for POA analysis
1 - quart glass jar for NOA analysis
1 - quart glass jar for PCB analysis
1 - quart glass jar for metals analysis
Note: P. re is a specific compound of interest
All samples iced

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey
ENVIRONMENTAL SERVICES DIVISION

Project Name Frederick Laboratories, St. Croix VI
Collector(s) Price Affiliation USEPA

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowel Cream Dipper
Automatic
Other _____

LDMS CODE M
DATA BASE CODE H
STA. TYPE CODE F

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
Solvent Extract Other ()

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container

Glass Jar
Plastic Jar
Metal
POA Vial
Cubitainer
Acetate Core
Paper Cap
Teflon Cap
Foil Cap
Other _____

Cleaning Procedure

Detergent Wash
Water Rinse
Acid Rinse
Solvent Rinse:
Acetone
Hexane
Methylene Chloride
Other (Specify): _____

Sample Source Type (Circle)

Landfill Industrial
Leachate Effluent
Drum Process Stream
Test Well Holding Pond
Depth: Drum
Other: Waste Pile
Municipal Treatment
Storage Tank Influent
Top Effluent-CI
Middle Effluent-Non CI
Bottom Sludge
Truck Ambient
Drum Lake
Tank Stream
Other: Pond
Ocean
Wells Estuary
Monitoring
Production
Drinking
Private

Preservation

Acid _____
Solvent _____
Chemical _____
Wet Ice
Dry Ice
Ambient
Other _____

Sample Location Description:

Composite from surface to 3 feet
Lab waste pit area

Remarks:

2- 40 ml. vials for POA analysis
1- quart glass jar for NVOA analysis
1- quart glass jar for PCB analysis
1- quart glass jar for metals scan
This line is a compound of specific interest
All samples used.

Samples to:

Bact ☐ Bio ☐ Chem ☒ Other ☐

Station No.

VID980651095

Sample Depth (Ft.)/Fac. Loc. Code

3200

Lab Number

085254

Type of Sample

Grab ☒ Composite
Time ☐ Space ☐

Collection (Ending) Date

Yr 86 Mo 03 Day 13

Ending Time (24 Hr)

1525

Beginning Date

Yr ☐ Mo ☐ Day ☐

Beginning Time (24 Hr)

☐ ☐ ☐ ☐

pH

☐ ☐ ☐ ☐

Sample Temp. (°C)

☐ ☐ ☐ ☐

DO (mg/l)

☐ ☐ ☐ ☐

Cond. (uMHOS/CM)

☐ ☐ ☐ ☐ ☐ ☐

Salinity(‰)

☐ ☐ ☐ ☐

Sample Split

☒ Yes ☐ No

If Yes With Whom? Facility contractor
Receipt ☒ Yes ☐ No

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

Project Name Berlex Laboratories, St. Croix VI
 Collector(s) Price Affiliation U.S.E.P.A.

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
 Niskin Net Seine Trawl Bucket
 Trowel Cream Dipper
 Automatic
 Other _____

LDMS CODE m
 DATA BASE CODE H
 STA. TYPE CODE F

SUBSTRATE TYPE (Circle)

Aqueous Sediment Sludge Oil Biological
 Solvent Extract Other ()

BOD - Seed Supplied ☐ Yes ☐ No Source: _____

Sample Preparation (Circle)

Container Cleaning Procedure
Glass Jar Detergent Wash
 Plastic Jar Water Rinse
 Metal Acid Rinse
POA Vial Solvent Rinse:
 Cubitainer Acetone
 Acetate Core Hexane
 Paper Cap Methylene Chloride
Teflon Cap Other (Specify): _____
 Foil Cap
 Other _____
 Preservation
 Acid _____
 Solvent _____
 Chemical _____
Wet Ice
 Dry Ice
 Ambient
 Other _____

Sample Source Type (Circle)

Landfill Industrial
 Leachate Effluent
 Drum Process Stream
 Test Well Holding Pond
 Depth: Drum
 Other: Waste Pile
 Municipal Treatment
 Storage Tank Influent
 Top Effluent-CI
 Middle Effluent-Non CI
 Bottom Sludge
 Truck Ambient
 Drum Lake
 Tank Stream
 Other Pond
 Ocean
 Wells Estuary
 Monitoring
 Production
 Drinking
 Private

Samples to:

Bact Bio Chem ☒ Other

Station No.

VID980651095

Sample Depth (Ft.)/Fac. Loc. Code

3201

Lab Number

085255

Type of Sample

Grab Composite
☒ Time Space

Collection (Ending) Date

Yr Mo Day
8 6 0 3 1 3

Ending Time (24 Hr)

1540

Beginning Date

Yr Mo Day

Beginning Time (24 Hr)

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☒ Yes ☐ No

If Yes With Whom? Facility contracts

Receipt ☒ Yes ☐ No

Sample Location Description:

Composite from surface to 3 feet
Lab waste pit area

Remarks:

2 - 40 ml. vials for POA analysis
1 - quart glass jar for NVOA analysis
1 - quart glass jar for PCB analysis
1 - quart glass jar for metals analysis
Date 8/6/03
All samples used.

FIELD DATA SHEET

ENVIRONMENTAL PROTECTION AGENCY - Region II, Edison, New Jersey

ENVIRONMENTAL SERVICES DIVISION

Project Name Beiler Laboratories, St. Croix VI
Collector(s) Kure Affiliation U.S. E.P.A.

SAMPLING METHOD (Circle)

Kemmerer Dredge Ponar Manual
Niskin Net Seine Trawl Bucket
Trowel Cream Dipper
Automatic
Other Beiler

LDMS CODE M
DATA BASE CODE H
STA. TYPE CODE F

SUBSTRATE TYPE (Circle) Aqueous Sediment Sludge Oil Biological
Solvent Extract Other ()

BOD - Seed Supplied ☐ Yes ☐ No Source:

Sample Preparation (Circle)

Container
Glass Jar
Plastic Jar
Metal
FOA Vial
Cubitainer
Acetate Core
Paper Cap
Teflon Cap
Foil Cap
Other

Preservation
Acid HNO₃ < 2
Solvent
Chemical
Wet Ice
Dry Ice
Ambient
Other

Cleaning Procedure
Detergent Wash
Water Rinse
Acid Rinse
Solvent Rinse:
Acetone
Mexane
Methylene Chloride
Other (Specify):

Sample Source Type (Circle)

Landfill
Leachate
Drum
Test Well
Depth:
Other:
Storage Tank
Top
Middle
Bottom
Truck
Drum
Tank
Other
Wells
Monitoring
Production
Drinking
Private
Industrial
Effluent
Process Stream
Holding Pond
Drum
Waste Pile
Municipal Treatment
Influent
Effluent-CI
Effluent-Non CI
Sludge
Ambient
Lake
Stream
Pond
Ocean
Estuary

Samples to:

Bact Bio Chem ☒ Other

Station No.

VI D980651095

Sample Depth (Ft.)/Fac. Loc. Code

3000

Lab Number

085256

Type of Sample

Grab Composite
☒ Time Space

Collection (Ending) Date

Yr Mo Day
8/6/83

Ending Time (24 Hr)

1605

Beginning Date

Yr Mo Day

Beginning Time (24 Hr)

pH

Sample Temp. (°C)

DO (mg/l)

Cond. (uMHOS/CM)

Salinity(‰)

Sample Split

☒ Yes ☐ No

If Yes With Whom? Facility contractor

Receipt ☒ Yes ☐ No

Sample Location Description:

On site well

Remarks:

2 - 40 ml vials for POA analysis
2 - 1 liter bottles for NUON analysis
1 - 1 liter bottle for PCB analysis
1 - gallon cubitainer for metals scan
preserved w/ HNO₃ to pH < 2
All samples used.

REFERENCE NO. 4

100495

☒ Generator

☐ transporter

☐ TSD

RCRA Enforcement

Interim Report- No Analysis data

Berlex Laboratories
St. Croix, VI

VID980651095

March 13, 1986

Participating Personnel:

Environmental Protection Agency

Carol Price, Environmental Scientist
Joseph Cosentino, Environmental Scientist
Steven Hale, Env. Protection Specialist
Michael Glogower, Life Scientist

Berlex Laboratories (ICC)

Allan Kyles, Vice-President,
Enviro-Sciences, Inc. (ESI)

Raymond Hays, Facility Handyman

Report prepared by:

Carol Price 5/11/86
Carol Price, Environmental Scientist
Source Monitoring Section

Approved for the Director by:

Richard D. Spear 5/15/86
Richard D. Spear, Chief
Surveillance & Monitoring Branch

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Summary

Objective

This RCRA enforcement inspection was conducted of Berlex Laboratories (ICC) at the request of the Solid Waste Branch in order to gather information necessary to determine the facility's compliance with applicable RCRA regulations.

Findings and Recommendations

1. Drums of hazardous material are being stored on the Berlex (ICC) site. Environmental Sciences, Inc. (ESI), the facility's contractor claims that these drums of chemicals have not been declared "waste" yet and so are not subject to accumulation and storage requirements. Most of the drums are the property of Virgin Island Chemical; no representative of this company was present on the site. ESI claims that thirty-three of the drums in storage belong to Berlex (ICC). The other drums (approximately 155) ESI says belong to Virgin Island Chemical. The attached inventory (Attachment 2), prepared by a Virgin Island Chemical representative but given to EPA by ESI, contains a listing of the drums in storage. The number in the inventory does not match the number counted by EPA.
2. A storm sewer that collects run-off from the facility discharges into a intermittent stream behind the Berlex (ICC) property. The facility does not have a NPDES permit.
3. The results of the analyses for organics, metals, and PCB's revealed the following:
 - Phthalates appeared in all of the samples ranging from 1000 ug/kg to 17,000 ug/kg in the soil samples and 3.9 ug/l to 280 ug/l in the water sample.
 - Organics contamination was higher in the sample taken from the gut sediments at the point of the drainage pit discharge than in the other samples. This contamination consisted of xylene, di-n-octyl phthalate, 1,4-dichlorobenzene, 1,2-dichlorobenzene, naphthalene, flourene, phenanthrene, and aliphatic and aromatic hydrocarbons.
 - Chloroform appeared in the on-site well at a level of 130 ug/l.
 - PCB's were detected below the detection limit in all six of the samples.
 - The metals arsenic (estimated value), beryllium (estimated value), chromium (ranging from 10 ug/kg to 52 ug/kg), copper (ranging from 40 ug/kg to 58 ug/kg), lead (estimated value), nickel (ranging from 19 ug/kg to 32 ug/kg), antimony (ranging from 8.4 ug/kg to 10 ug/kg), selenium (estimated value), and zinc (ranging from 63 ug/kg to 360 ug/kg) were all detected in the sediment samples. Arsenic, beryllium, cadmium, chromium, copper, mercury, antimony, and zinc were all detected in the water sample at estimated values.

Purpose of Survey

A RCRA enforcement inspection was conducted at Berlex Laboratories (otherwise known as Island Chemical Company or ICC), St. Croix, VI. The survey was conducted at the request of the Solid Waste Branch to generate additional information necessary to determine the facility's compliance with RCRA regulations. The elements of the survey included a review of the facility's history; inspection of the facility; and the sampling of the stream sediments behind the plant, the laboratory waste pit, and an on-site well.

Facility History

The Berlex (ICC) facility has undergone many changes in ownership since it opened. The owner of the land itself, that the facility is built on, has remained constant. A local landowner originally leased the land on a 99 year lease. The first operator of the plant was Pierell America, Inc., who started operations in 1972. There were several other owners of the facility until 1979, when Berlex Laboratories (ICC) obtained the facility, having merged with the then current owner, Cooper Laboratories.

Berlex Laboratories (ICC), a subsidiary of Scheering, began operating in November 1979. Their process involved taking quinidine (found in the eucalyptus tree) and changing isomers in the substance to convert it to quinine. This process continued through late 1982. In October 1982 Berlex (ICC) notified EPA of the forthcoming closure and removal of waste materials and excess chemicals (xylene, toluene) to Inland Chemical of Puerto Rico. EPA assigned Berlex (ICC) the RCRA identification number VID80651095. Prior to this removal, Berlex (ICC) was operating as a small quantity generator.

In 1984 Berlex (ICC) sold the facility to Virgin Island Chemical. Virgin Island Chemical planned to produce benzyl acetate at the site by reacting benzyl chloride with acetic acid. This process was in operation for approximately 6-8 months, but ceased when the market price of benzyl acetate plummeted.

As part of the sales contract with Virgin Island Chemical, Berlex (ICC) was required to clean up any contamination present at the site. Berlex (ICC) hired Enviro-Sciences, Inc. (ESI) of Denville, NJ, to survey the site and certify it as environmentally clean. ESI's sampling survey disclosed four areas of contamination. Two areas, between tanks 8 and 9 and concrete slab #3 (see Figure 1) were found to be contaminated, primarily with toluene. This contamination was thought to be from process spills. The other two areas, along trench #9 and underneath the concrete loading dock, were contaminated primarily with pyridine, thought to be from a leaking laboratory drain. The quantity of contaminants was estimated at 125 pounds of toluene and 120 pounds of pyridine.

ESI recommended on-site treatment of this contaminated soil. The toluene contaminated soil was to be placed in a drying oven equipped with carbon filters, so that emission rates did not exceed the 200 ppm TLV for toluene.

The pyridine contaminated soil was to be treated by cutting the concrete pad and tilling the soil every 2-3 days to allow the soil to aerate. A structure was to be built over the area to prevent soil saturation from rainfall. ESI reported by letter on May 15, 1985 that this clean-up would be initiated on June 6, 1985.

The Environmental Services Division conducted an inspection of Berlex Laboratories (ICC) on September 9, 1985. The findings of this inspection are summarized in the attached report (Attachment 1) . On October 10, 1985, 192 fifty-five gallon drums of waste were shipped from Berlex (ICC) to Chemical Waste Management in Alabama (see Attachment 2 - Hazardous waste manifests). This waste included:

- ° Toluene contaminated soil which had been treated in the drying oven
- ° Process pit water and sludge
- ° Drums and soil from the wastewater drainage line

The pyridine contaminated soil remained in place.

As of March 13, 1986, Virgin Island Chemical is not operating the facility. A warehouse full of drums exists on the site. ESI claims that approximately 33 of these drums belong to Berlex (ICC). According to ESI the drums contain mostly laboratory reagents, washings, and miscellaneous materials. These have been sampled by ESI and analysis is currently underway. The remaining drums belong to Virgin Island Chemical. These drums contain raw materials, product, and other incidentals used in the Virgin Island Chemical process. A count of these drums yielded a number of approximately 155. According to an inventory of drums by Virgin Island Chemical, which ESI possessed, the number should have been approximately 208. According to ESI, this inventory may have not been accurate because some of the materials may have been re-sold on the island. A representative of Virgin Island Chemical was not present during the inspection. A listing of the drum inventory is provided as Figure 2.

Presently, plans are being developed for U.S. Resources, Inc. to lease the site from Virgin Island Chemical. A representative of U.S. Resources was present on the site on the day of the inspection and some of the company's equipment was present on-site. U.S. Resources, Inc. plans to operate the facility as an alcohol conversion plant. The process involves dehydrating alcohol contaminated with water, which is then used to make gasohol.

Facility areas/treatment units inspected

During the March 13th inspection the following areas were inspected and/or sampled:

°Process pit

The process pit is an 8,000 gallon underground concrete pit that was used to contain process wastewater and sludge that settled from this wastewater. This pit was cleaned out in 1982 when Berlex (ICC) shut down operations. The sludge and wastewater present in the tank were

disposed of locally. In 1985 ESI tested water which was found accumulating in the tank. The results from this analysis showed contamination consisting of benzyl chloride and some heavy metals. The pit was cleaned again and the contents were shipped to Chemical Waste Management in Alabama as "hazardous waste liquid, N.O.S". This tank was not sampled during the March 13th inspection, as originally planned, because it was sealed with concrete after the 1985 clean-out.

°Toluene drying oven

The oven used for the treatment of toluene contaminated soil was found to be empty during the March 13th inspection (see photos 1 and 2). According to ESI's representative, the soil present during EPA's September 9, 1985 inspection was shipped to Chemical Waste Management in October 1985.

°Pyridine contaminated pad

The concrete pad located behind the Berlex (ICC) facility was the area of pyridine contamination. The pad was broken up and the soil tilled every 2-3 days as treatment for the removal of pyridine as specified in ESI's workplan. At the time of the March 13th inspection the area was uncovered, and according to ESI, had not been tilled recently.

Two samples, #085254 and #085255, were taken from this area. A composite of the soil from the surface to a three foot depth was obtained. A sample, #085252, was also taken from a suspected area of seepage into the intermittent stream behind the Berlex (ICC) plant. This soil sample was a composite from the surface to approximately 10 inches in depth. A background soil sample, #085251, was also taken upstream of the Berlex property for comparison purposes.

°Storm water sewer

According to ESI, the original storm water sewer at the facility consisted of old, clean toluene drums welded together and attached to a concrete line. In October 1985 the line was excavated and the drums were found to be corroded. Sludge was found to be accumulated in the bottom of the line. The drums, sludge, and two feet of soil were removed and shipped out. A new PVC line was installed (see photo 3). Although this storm water sewer discharges into an intermittent stream located at the edge of the property, the facility does not possess a NPDES permit. Sampling done earlier in this area by ESI revealed higher than background levels of zinc, cadmium, chromium, and lead.

A soil sample, #085253, was taken at the point of discharge to the intermittent stream. During sampling, a tropical rainstorm developed, and water was observed discharging from the pipe (see photos 4 and 5).

°Production well

During the inspection a production well was discovered on-site. The well was not in use at the time, but was still operable. ESI had no knowledge

of the purpose, depth, or construction of the well or which owner of the facility had installed or used it. A water sample, #085256, was taken from this well (see photo 6).

°Drum storage area

A variety of chemicals are presently being stored in a warehouse located on the Berlex (ICC) property. According to ESI, the drums contain raw materials, product, and incidentals from Virgin Island Chemical and Berlex (ICC). Approximately 188 drums were found to be stored during the March 13th inspection (see photos 7, 8, 9, and 10). Attachment 2 lists the name and quantity of waste stored, according to Virgin Island Chemical's inventory and ESI's statements.

Sampling procedures

A total of six samples were taken from the Berlex (ICC) facility (see Figure 2- Map of sampling points). Three of the six samples were taken from the intermittent stream (known as the "gut") that runs along the edge of the Berlex (ICC) property. The first sample taken, #085251, was a background soil sample to be used as a comparison to the other samples taken from the gut. The sample was taken from the surface mud using polyethylene scoops and mixed on Benchkote paper to insure representative split samples. The sample was analyzed for purgeable organics (POA's), non-volatile organics (NVOA's), PCB's, and metals.

The second and third samples, #085252 and #085253, were soil samples taken from areas of the gut directly behind the Berlex (ICC) facility. Sample #085252 was taken from an area behind the laboratory drainage pit where drainage may have seeped into the gut. Sample #085253 was taken from the area of the gut where the storm sewer discharges. Both of these soil samples were taken from the surface to a depth of 10" using a stainless steel hand auger. The first core from the auger was discarded to minimize cross-contamination; the remaining cores were mixed on Benchkote paper in order to obtain a well-mixed representative sample. Both of the samples were analyzed for POA's, NVOA's, PCB's and metals.

Two soil samples were obtained from the laboratory waste drainage pit. The first sample, #085254, was taken approximately 10 feet from the building, and the second, #085255, approximately 20 feet from the building. The stainless steel bucket auger (rinsed with water and deionized water) was used to obtain cores to a depth of 3 feet. The cores were mixed on Benchkote paper in order to obtain a representative and well-mixed sample. Both of the samples were analyzed for POA's, NVOA's, PCB's, and metals.

The sixth sample, #085256, was obtained from the production well located on the site. Since the well was of indeterminate diameter and depth, a precise determination of the volume of water to be removed could not be made. By considering the average depth to groundwater in the area of the Berlex (ICC) facility, and the apparent size of the well casing, it was estimated that purging 150 gallons from the well would remove 3-5 times the well volume and samples representative of the groundwater would be obtained. Consequently, the well was pumped for 6 minutes and 20 seconds, removing 170 gallons of water. The sample was then taken directly from the plastic hose attached to the well head to minimize damage to the well head.

All samples were split, with ESI acting for the facility. The samples were collected in appropriate containers and preserved according to EPA protocol. All samples were shipped on ice the following day to EPA's Edison laboratory.

Results of Analysis

The results of the analysis of the sediment and water samples are summarized on three tables. Table 1 presents a list of organic compounds for which analyses were conducted. This list does not include compounds which the laboratory may have identified as major peaks. Table 2 shows the organic compounds that were identified in the samples collected. Table 3 lists the results of the metal scan analysis.

Most of the samples showed some organics contamination. All of the samples, including the background sample taken in the gut, contained phthalates, chiefly di-n-octyl phthalate, with butyl benzyl phthalate and bis(2-ethyl hexyl phthalate also appearing in a few samples. These values ranged from 1000 ug/kg to 17,000 ug/kg in the soil samples and 3.9 ug/l to 280 ug/l in the water sample. The results from the sample taken in the gut, at the point where the drainage line discharges (#085253), showed more contamination. This sample contained xylene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, di-n-octyl phthalate, naphthalene, flourene, phenanthrene, and aliphatic and aromatic hydrocarbons. The on-site well results showed contamination with chloroform. The PCB analysis results showed the presence of PCB's below the detection limit in all of the samples.

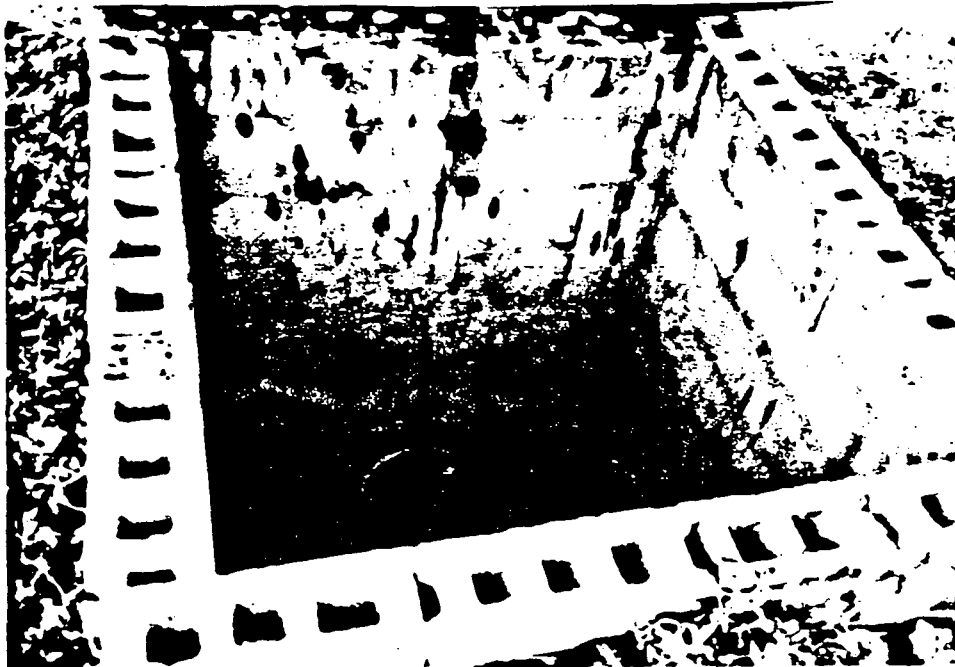
The results of the metals analyses, for the sediment samples, showed varying levels of arsenic, beryllium, chromium, copper, lead, nickel, antimony, selenium, and zinc. The results of the metals analyses for the water sample showed estimated levels of arsenic, beryllium, cadmium, chromium, copper, mercury, antimony, and zinc. The value for chromium in the sediment samples increased from the background level of 10 ug/kg to 52 ug/kg at the point of the drainage pit discharge, finally leveling off to 25 and 27 ug/kg in the lab waste pit. The value for copper remained fairly constant through all the samples. The value for zinc decreased from background to the point where the lab waste pit seeped into the gut, but increased to a high of 360 ug/kg at the point where the drainage pit discharged into the gut. The value leveled off to 79 and 80 ug/kg in the lab waste pit. The value for nickel was also higher at the point where the drainage pit discharged into the gut, with as value of 32 ug/kg.



1. Oven formerly used for the drying
of toluene contaminated earth.



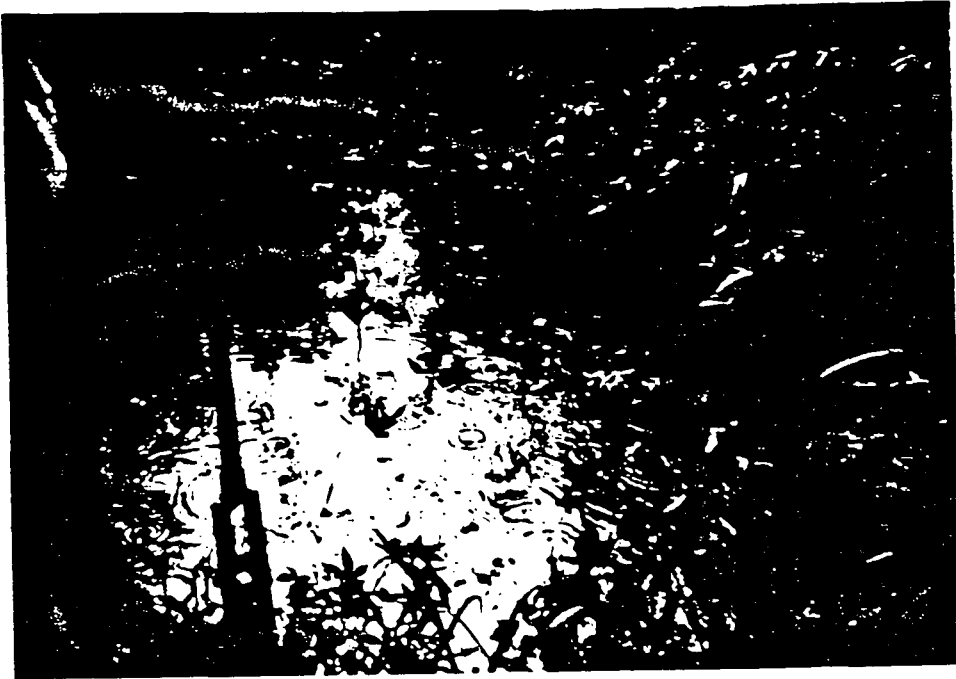
2. Former toluene drying oven.



3. Polyethylene storm sewer line replaced in 1985.



4. Storm sewer discharge into intermittent stream behind Berlex property during tropical storm.



5. Sampling of intermittent stream bed during discharge of storm sewer.

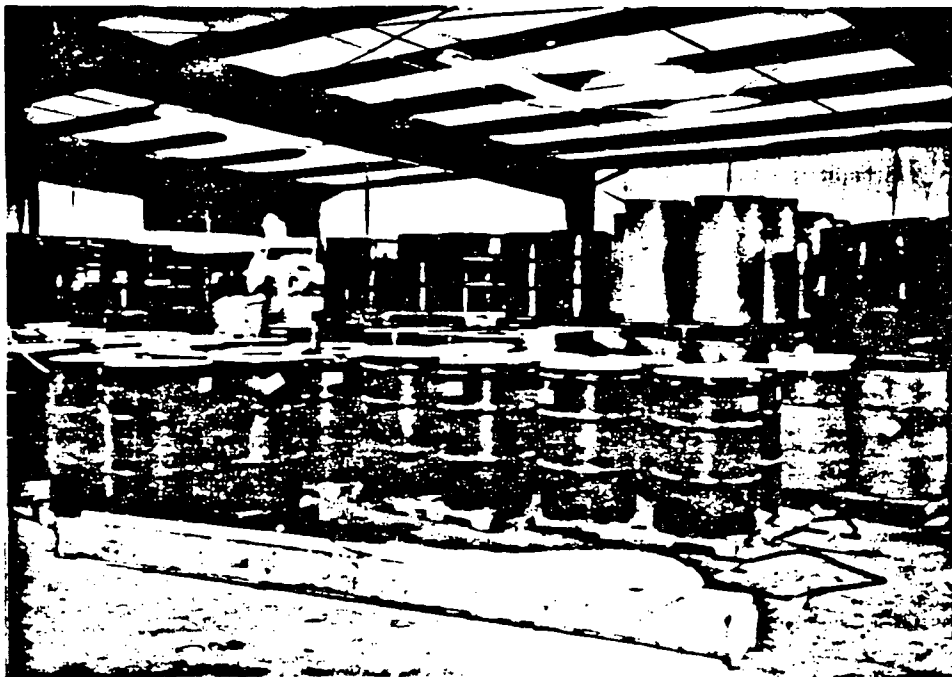


6. Production well located on-site.

100506



7. Warehouse used for drum storage- first room of drums



8. Warehouse used for drum storage- second room of drums

100507



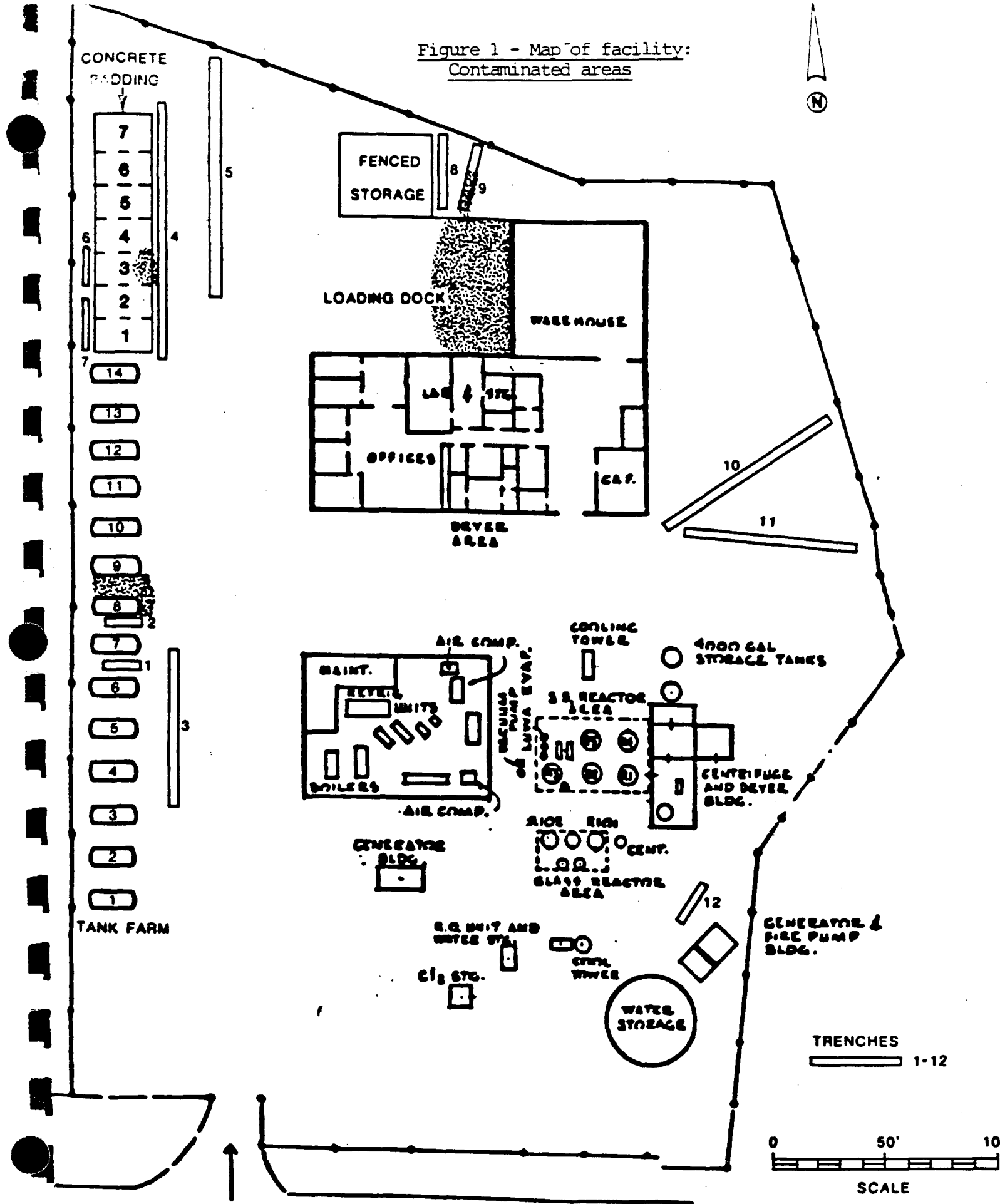
9. Lab pack drums stored in warehouse.



10. Close-up of drums of benzyl chloride in warehouse.

100508

Figure 1 - Map of facility:
Contaminated areas



ISLAND CHEMICAL PLOT PLAN

Figure 2 - Drums in storage

Virgin Island Chemical drums:

<u>Type of material</u>	<u>Waste #</u>	<u>Size of drum</u>	<u>Quantity</u>
Anti-freeze		55 gallon	19
Miscellaneous detergent		20 gallon, 15 gallon	13
Salt		35 gallon (fiber)	2
Toluene	U220	55 gallon	10
Lube oil		55 gallon	5
Modul		35 gallon (fiber, steel)	2
Herbicide		55 gallon (plastic)	1
Benzyl chloride	P028	55 gallon	28
Methyl isobutyl carbonyl		55 gallon	12
Salicylic acid		55 gallon (fiber)	27
Sodium hydroxide		55 gallon (plastic)	33
Acetic acid		55 gallon	18
Triethylamine (TEA)		55 gallon	3
Acetone	U002	55 gallon	1
Methyl isobutyl ketone	U161	55 gallon	1
Sulfanic acid		55 gallon (fiber)	1
Sodium acetate		35 gallon	1
Sodium hexametaphosphate		35 gallon	1
Benzyl acetate		55 gallon	22
Toluene-acetone mix	U002,U220	55 gallon	2
Methanol		55 gallon	4
Sodium hydroxide (solid)		55 gallon	2
			<u>208</u>

Chloroform drums (empty)

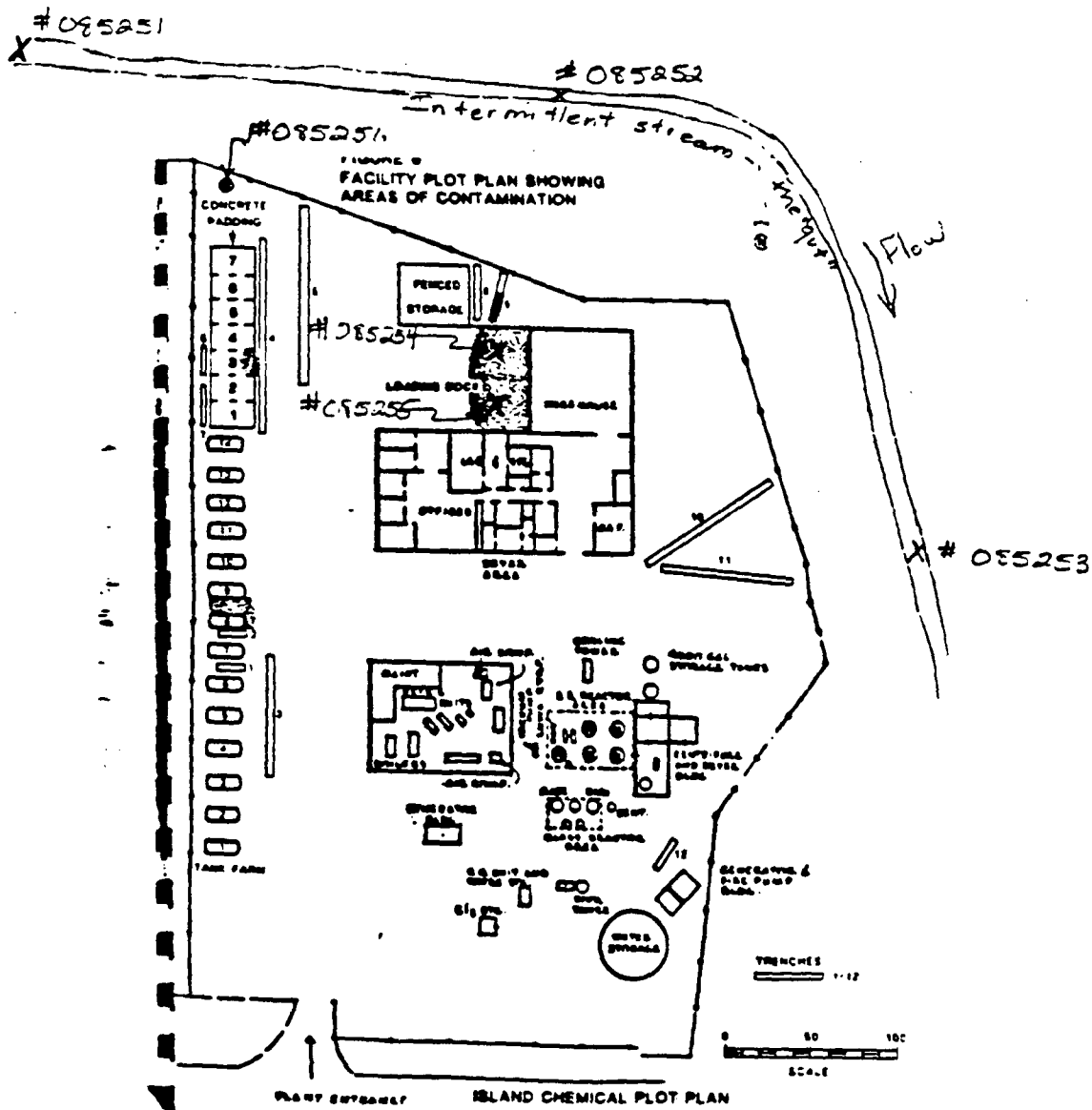
55 gallon

4

Berlex (ICC) drums:

<u>Type of material</u>	<u>Quantity</u>
Lab chemicals (Aceto-nitrate, Acetic acid)	33 (total)
Washings	
Cut up drums	
Miscellaneous materials	
Crystallized material	

Figure 3
Map of sampling points



X = Sampling point

• = Production well

Table 1 - Organic compounds for which analysis was conducted

Acid Compounds

2,4,6-trichlorophenol
p-chloro-n-cresol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2-nitrophenol
4-nitrophenol
2,4-dinitrophenol
4,6-dinitro-o-cresol
pentachlorophenol
phenol

Base/Neutral Compounds

4-bromophenyl phenyl ether
bis-(2-chloroisopropyl) ether
bis(2-chloroethoxy)methane
hexachlorobutadiene
hexachlorocyclopentadiene
isophorone
naphthalene
nitrobenzene
N-nitrosodiphenylamine
N-nitroso-n-propylamine
bis(2-ethylhexyl)phthalate
butyl benzyl phthalate
di-n-butyl phthalate
di-n-octyl phthalate
diethyl phthalate
dimethyl phthalate
benzo(a)anthracene
benzo(a)pyrene
3,4-benzofluoranthene
benzo(k)fluoranthene
chrysene
acenaphthylene
anthracene
benzo(ghi)perylene
fluorene
phenanthrene
dibenzo(a,h)anthracene
indeno(1,2,3-cd)pyrene
pyrene

Volatiles

acrolein
acrylonitrile
benzene
carbon tetrachloride
chlorobenzene
1,2-dichloroethane
1,1,1-trichloroethane
1,1-dichloroethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
chloroethane
2-chloroethylvinyl ether
chloroform
1,1-dichloroethene
1,2-trans-dichloroethene
1,2-dichloropropane
1,3-dichloropropene
ethylbenzene
methylene chloride
chloromethane
bromoethane
bromoform
dichlorobromomethane
trichlorofluoromethane
dichlorodifluoromethane
chlorodibromomethane
tetrachloroethylene
toluene
trichloroethylene
vinyl chloride

Pesticides

aldrin
dieldrin
chlordane
4,4'-DDE
4,4'-DDT
4,4'-DDD
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide
MCC-Alpha
MCC-Beta
MCC-Delta
MCC-Gamma
PCB-1242
PCB-1254
PCB-1221
PCB-1232
PCB-1240
PCB-1260
PCB-1016
toxaphene

Dioxins
2,3,7,8-tetrachlorod
p-dioxin

Base/Neutral Compounds

acenaphthene
benzidine
1,2,4-trichlorobenzene
hexachlorobenzene
hexachloroethane
bis(2-chloroethyl) ether
2-chloronaphthalene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3'-dichlorobenzidine
2,4-dinitrotoluene
2,6-dinitrotoluene
1,2-diphenylhydrazine
(as azobenzene)
fluoranthene
4-chlorophenyl phenyl ether

List does not include compounds identified as other major peaks.

Table 2 - Results of Organic Analysis- Organic Compounds Detected

<u>Compound name</u>		<u>Sample location/Sample #</u>					
<u>VOA</u>		Gut Back-ground* #085251	Lab waste pit seep #085252	Drainage pit disch. #085253	Lab waste pit # 1 #085254	Lab waste pit # 2 #085255	On-site well (ug/l) #085256
Xylene Chloroform				470			130
<u>NVOA</u>							
Butyl benzyl phthalate		1000					2K
Di-n-octyl phthalate		17000	9000	7700	4900	3200	3.9
1,4 dichlorobenzene				870			
1,2 dichlorobenzene				2900			
Napthalene				2100			
Flourene				2000			
Phenanthrene				2400			
Bis(2-ethylhexyl)phthalate							280
Aliphatic & aromatic hydrocarbons				M			
<u>PCB</u>							
PCB-1016	100513	1000K	1000K	1000K	1000K	1000K	1K
PCB-1221		1000K	1000K	1000K	1000K	1000K	1K
PCB-1232		1000K	1000K	1000K	1000K	1000K	1K
PCB-1242		1000K	1000K	1000K	1000K	1000K	1K
PCB-1248		1000K	1000K	1000K	1000K	1000K	1K
PCB-1254		1000K	1000K	1000K	1000K	1000K	1K
PCB-1260		1000K	1000K	1000K	1000K	1000K	1K

*All values in ug/kg except where otherwise stated.

K = Actual value known to be less than value given.

M = Presence of material verified but not quantified.

Blank space means compound was not detected in sample analysis.

Table 3 - Results of Metals Scan Analysis

<u>Compound name</u>		<u>Sample location/Sample #</u>				
	Gut Back-ground* #085251	Lab waste pit seep #085252	Drainage pit disch. #085253	Lab waste pit # 1 #085254	Lab waste pit # 2 #085255	On-site well (ug/l) #085256
Silver						
Arsenic	2J	1J	0.8J	0.8J	2J	2J
Beryllium		7J	8J	7J	7J	5J
Cadmium						3J
Chromium	10	22	52	27	26	7J
Copper	40	45	52	55	58	8J
Mercury						0.6J
Lead			30J			
Nickel	19	20J	32	25	27	
Antimony		10		8.4		3J
Selenium	1J		1J	0.8J	0.8J	
Thallium						
Zinc	100	63	360	80	79	20J

*All values in mg/kg except where otherwise stated.

J = Estimated value.

M = Presence of material verified but not quantified.

Blank space means compound was not detected in sample analysis.

100514

Attachment 1:

ESD Report of September 9, 1985

Berlex Laboratories (ICC)
VID980651095

March 13, 1986

REFERENCE NO. 5

100516



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

C1 STATE VI C2 SITE NUMBER E004V

II. SITE NAME AND LOCATION

01 SITE NAME (Name, address, or descriptive name of site) VI Chem (Island Chemical)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER Route 66				
03 CITY St. Croix	04 STATE USVI	05 ZIP CODE 00820	06 COUNTY Christiansted	07 COUNTY CODE	08 CONG DIST
09 COORDINATES LATITUDE 17° 42' 26"	LONGITUDE 64° 47' 23"				

10 DIRECTIONS TO SITE (Starting from nearest public road)
From Alexander Hamilton Airport- Take airport road to Melvin Evans Highway (Rt.66)
Make a left onto Melvin Evans. Make first U-Turn. Turn left onto property at the
last driveway before the light.

III. RESPONSIBLE PARTIES

01 OWNER (if owner) Charles H. Steffey Holding Corp.	02 STREET (Business, mailing, residential) 540 Baltimore Annapolis Blvd		
03 CITY Severna Park	04 STATE MD	05 ZIP CODE 21146	06 TELEPHONE NUMBER () unk
07 OPERATOR (if owner and operator are different) Fred Schubert	08 STREET (Business, mailing, residential) Pondside East Road		
09 CITY Richmond	10 STATE MA	11 ZIP CODE 01254	12 TELEPHONE NUMBER (413) 698-2258
13 TYPE OF OWNERSHIP (Check one) ☒ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER: ☐ G. UNKNOWN			

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☐ A. RCRA 3001 DATE RECEIVED: 02 / 1 / 89 ☐ B. UNCONTROLLED WASTE SITE (RCRA 102(a)) DATE RECEIVED: / / ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION ☒ YES DATE 1 / 31 / 89 ☐ NO	02 BY (Check all that apply) ☒ A. EPA ☒ B. EPA CONTRACTOR ☒ C. STATE ☐ D. OTHER CONTRACTOR ☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: ☐ G. UNKNOWN CONTRACTOR NAME(S): Roy F. Weston TAT
03 SITE STATUS (Check one) ☒ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN	04 YEARS OF OPERATION 5/1/69 Present ☐ UNKNOWN BEGINNING YEAR ENDING YEAR

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

SEE ATTACHED TABLES

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

Direct contact to persons and dogs living and working on-site.
Risk of fire/explosion, prison located downwind.
Groundwater contamination with chloroform.
Incompatible materials stored in close proximity.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one) (Check one) (Check one) (Check one)
☒ A. HIGH ☐ B. MEDIUM ☐ C. LOW ☐ D. NONE

VI. INFORMATION AVAILABLE FROM

01 CONTACT Francine Lang	02 OF (Agency or Organization) Dept of Planning and Natural Resources	03 TELEPHONE NUMBER (809) 773-0565		
04 PERSON RESPONSIBLE FOR ASSESSMENT Doug Kodama	05 AGENCY EPA	06 ORGANIZATION R & P Branch	07 TELEPHONE NUMBER (201) 906-6905	08 DATE 2 / 10 / 89 MONTH DAY YEAR



X- HIGHLY VOLATILE
 J- EXPLOSIVE
 K- REACTIVE
 L- INCOMPATIBLE
 M- NOT APPLICABLE

100518



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

1. IDENTIFICATION

01 STATE: VI 02 SITE NUMBER: E004V

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ~~XX~~ A. GROUNDWATER CONTAMINATION 02 ☐ OBSERVED (DATE: 11/88) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 400 04 NARRATIVE DESCRIPTION

Wells which are used as a source of public drinking water have been found to be contaminated with Chloroform at between 11 and 75 ppb. RCRA enforcement reports 130 ppb Chloroform in the on-site well.

01 ~~XX~~ B. SURFACE WATER CONTAMINATION 02 ☐ OBSERVED (DATE: 1/31/89) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 20 04 NARRATIVE DESCRIPTION

An intermittent stream originates on the north side of the Island, flows adjacent to the site, and discharges into the Caribbean Sea.

01 ~~XX~~ C. CONTAMINATION OF AIR 02 ☐ OBSERVED (DATE: 1/31/89) ☐ POTENTIAL ☒ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 100 04 NARRATIVE DESCRIPTION

All ambient air monitoring was equivalent to background, however, many open and leaking containers were observed which may release compounds into the air.

01 ~~XX~~ D. FIRE/EXPLOSIVE CONDITIONS 02 ☐ OBSERVED (DATE: 1/31/89) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 100 04 NARRATIVE DESCRIPTION

Ethyl ether, sodium metal, diisobutyl aluminum hydride and incompatible materials are stored haphazardly throughout the site. These materials have the potential to cause an explosion.

01 ~~XX~~ E. DIRECT CONTACT 02 ☐ OBSERVED (DATE: 1/31/89) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 4-10 04 NARRATIVE DESCRIPTION

One person lives on-site in a trailer, several people are on-site each day as workers. Guard dogs which have access to the chemical storage areas are moved to banks each night, potentially spreading contamination. The site is fenced.

01 ~~XX~~ F. CONTAMINATION OF SOIL 02 ☐ OBSERVED (DATE: 1/31/89) ☐ POTENTIAL ☒ ALLEGED
03 AREA POTENTIALLY AFFECTED: 3.5 04 NARRATIVE DESCRIPTION

A small patch of potentially PCB oil soaked ground observed. Reports of past spills of pyridine and other laboratory chemicals presented by RCRA enforcement in March 1986.

01 ~~XX~~ G. DRINKING WATER CONTAMINATION 02 ☐ OBSERVED (DATE: 11/88) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 400 04 NARRATIVE DESCRIPTION

VI Port Authority wells have shown Chloroform contamination downgradient of the site.

01 ~~XX~~ H. WORKER EXPOSURE/INJURY 02 ☐ OBSERVED (DATE: 1/31/89) ☒ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: 4-10 04 NARRATIVE DESCRIPTION

Kate Wesp operates a dog kennel and lives on-site. Her assistants as well as owners and operators from VIAG Fuels are on-site and inside the buildings on a regular basis.

01 ~~XX~~ I. POPULATION EXPOSURE/INJURY 02 ☐ OBSERVED (DATE: 1/31/89) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 400 04 NARRATIVE DESCRIPTION

Several industries, businesses, residences, an airport and a prison are located in the general vicinity of the site.

100519



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
C1 STATE VI C2 SITE NUMBER E004V

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA 02 ☐ OBSERVED (DATE _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
No observed damage to flora.

01 ☒ K. DAMAGE TO FAUNA 02 ☐ OBSERVED (DATE: 5/89) ☐ POTENTIAL ☒ ALLEGED
04 NARRATIVE DESCRIPTION (Include names of species)
Bats were observed in the warehouse, damage unknown.

01 ☒ L. CONTAMINATION OF FOOD CHAIN 02 ☐ OBSERVED (DATE: 1/31/89) ☐ POTENTIAL ☒ ALLEGED
04 NARRATIVE DESCRIPTION
The prison located within 1/4 mile of the site operates a farm which sells vegetables to the local population

01 ☒ M. UNSTABLE CONTAINMENT OF WASTES 02 ☐ OBSERVED (DATE: 1/31/89) ☒ POTENTIAL ☐ ALLEGED
(Include name of containing facility/containment system)
03 POPULATION POTENTIALLY AFFECTED: 100 04 NARRATIVE DESCRIPTION
Two drums have had their lids popped off by some unknown reaction. Lab chemicals observed dripping contents down storage cabinet shelves.

01 ☒ N. DAMAGE TO OFF-SITE PROPERTY 02 ☐ OBSERVED (DATE: 1/31/89) ☐ POTENTIAL ☒ ALLEGED
04 NARRATIVE DESCRIPTION
Groundwater contamination and the potential for past illegal discharges exists.

01 ☒ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 02 ☐ OBSERVED (DATE: 1/31/89) ☐ POTENTIAL ☒ ALLEGED
04 NARRATIVE DESCRIPTION
The intermittent stream acts as the storm water runoff system.

01 ☒ P. ILLEGAL/UNAUTHORIZED DUMPING 02 ☐ OBSERVED (DATE: 3/13/86) ☐ POTENTIAL ☒ ALLEGED
04 NARRATIVE DESCRIPTION
RCRA enforcement reported spills of pyridine and a potentially leaking laboratory drainage system. Also process spills of toluene.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: 400

IV. COMMENTS

V. SOURCES OF INFORMATION (List specific references; e.g., State and Federal Agency Reports)

RCRA enforcement report 3/13/86.
DPRR summary of site conditions.
VIChem letter to Centerchem 2/1/85.
TAT site evaluation report 2/10/89.
TAT St. Croix well survey 10/25/88.

07/14/89

TABLE 1

Laboratory Reagent Inventory

CHEMICAL NAME =====	COMPANY =====	QTY ===	STATE =====
1,3-dinitrobenzene	Aldrich Chemical	100 g	solid
1-butanol	J.T.Baker Chemical	500 ml	liquid
1-chlorobutane	MCB	4 L	liquid
1-propanol	J.T.Baker Chemical	500 ml	liquid
18-Crown-6 99%	Aldrich Chemical	25 g	solid
2,2-oxydiethanol	Kodak	1 kg	liquid
2,6-dimethoxybenzoic acid 99%	Aldrich Chemical	25 g	solid
2,6-ditertiarybutyl p-cresol	Biesterfeld	500 g	solid
2-hydroxybenzyl alcohol 99%	Aldrich Chemical	25 g	liquid
2-hydroxyethyl ether	Aldrich Chemical	1 kg	liquid
2-methyl-1-butanol 99%	Aldrich Chemical	10 g	liquid
2-methylbutyl amine	American Laboratorie	15 g	liquid
3,3-dimethoxy benzidene	Kodak	100 g	solid
3-hydroxybenzoic acid	Aldrich Chemical	100 g	solid
4-chlorobenzene sulfonamide	Aldrich Chemical	100 g	solid
4-hydroxy 4methyl 2pentanone	Aldrich Chemical	500 g	liquid
4-hydroxybenzoic acid	Aldrich Chemical	50 g	solid
4-methylbenzo phenone 97%	Aldrich Chemical	50 g	solid
9-hydroxyflourene	Aldrich Chemical	2x25 g	solid
Acetic acid	MCB	2x5 lb	liquid
Acetone	Fisher Scientific	4 L	liquid
Acetonitrile	Supelco	1 box	liquid
Alkalinity C,D,E,G	Mogul Corporation	4x2 oz	liquid
Aluminum Chloride	Mallinckrodt	1 lb	solid
Aluminum chloride	Witco Chemical	500 g	solid
Ammonium acetate	Fluka	1 kg	solid
Ammonium acetate	Aldrich Chemical	2 kg	solid
Ammonium acetate purified	Jarchem Industries	250 g	solid
Ammonium hydroxide	Sargent Welch Scient	500 ml	liquid
Ammonium persulfate	J.T.Baker Chemical	2.5 kg	solid
Ammonium persulfate	J.T.Baker Chemical	500 g	solid
Ammonium thiocyanate	Fisher Scientific	500 g	liquid
Amyl alcohol	Mallinckrodt	1 pt	liquid
Arsenic trioxide	Fisher Scientific	2x113g	solid
Barium chloride	Drew Chemical	1 qt	liquid
Barium chloride	Mallinckrodt	500 g	solid
Barium chloride	Fisher Scientific	1 lb	solid
Barium hydroxide	Fisher Scientific	1 lb	solid
Benzaldehyde	J.T.Baker Chemical	500 ml	liquid
Benzene	Tenneco Oil	2x1gal	liquid
Benzhydrol	Kodak	100 g	solid
Benzoic acid	Mobay Chemical	1 lb	solid
Benzoin	Fluka	2x1 kg	solid
Benzoin 98%	Aldrich Chemical	4x500g	solid

07/14/89

TABLE 1

Laboratory Reagent Inventory

CHEMICAL NAME =====	COMPANY =====	QTY ===	STATE =====
Benzophenone	Aldrich Chemical	500 g	solid
Benzophenone	H&S Chemical	1 bag	solid
Benzophenone	Upjohn	500 g	solid
Benzophenone 99+%	Aldrich Chemical	50 g	solid
Benzoyl chloride	Mobay Chemical	1 lb	solid
Benzyl acetate 99%	Aldrich Chemical	100 g	liquid
Benzyl alcohol	Mallinckrodt	1 pt	liquid
Benzyl benzoate	Aldrich Chemical	100 g	liquid
Benzyl chloride	unknown	4 oz	liquid
Benzyl chloride	Velsicol	500 g	liquid
Benzyl cinnamate 98%	Aldrich Chemical	100 g	solid
Benzyl ether	Aldrich Chemical	1 kg	liquid
Benzyltriethylammoniumchloride	Aldrich Chemical	25 g	solid
Bismuth subnitrate	MCB	1 lb	solid
Bromine	Fisher Scientific	113 g	liquid
Bromophenol blue	Fisher Scientific	5 g	solid
Brucine sulfate	Fisher Scientific	1 oz	solid
Buffer solution pH 10.00	Fisher Chemical	500 ml	liquid
Buffer solution pH 4.00	Fisher Scientific	500 ml	liquid
Buffer solution pH 7.00	Fisher Chemical	500 ml	liquid
CAO-3 BHT	Sherwin Williams	1 bag	solid
Calcium sulfate anhydrous	W.A.Hammond Drierite	4x5 lb	solid
Cello-Seal	Fisher Scientific	25 g	liquid
Chloride F	Mogul Corporation	3 oz	liquid
Chlorodiphenyl methane 98%	Aldrich Chemical	100 g	solid
Chloroform	Fisher Scientific	4 L	liquid
Chromotropic acid Na salt	Fisher Scientific	25 g	solid
Cinnamaldehyde	unknown	2x1 kg	liquid
Citric acid anhydrous	J.T.Baker Chemical	500 g	solid
Citricacidtrisodiumdihydrate	Aldrich Chemical	1 kg	solid
Cobalt chloride	Fisher Scientific	2x1 lb	solid
Color standard 4	unknown	1 oz	liquid
Congo red	Fisher Scientific	25 g	solid
Copper metal	Fisher Scientific	500 g	solid
Cupric sulfate	Fisher Scientific	500 g	solid
Cupric sulfate	Mallinckrodt	500 g	solid
DPD #1,2,3 Reagents	Taylor Chemical	3x1 oz	liquid
Dibenzo 18-Crown-6 98%	Aldrich Chemical	50 g	solid
Dibenzoyl tartaric acid	Knoll Fine Chemicals	1 kg	solid
Dichloroethane 99%	Aldrich Chemical	1 kg	liquid
Dichlorophenyl methane 99%	Aldrich Chemical	25 g	solid
Dichlorotoluene 99%	Aldrich Chemical	100 g	solid
Diethylene glycol	Fisher Scientific	1 qt	liquid
Diisobutyl aluminum hydride	Texas Acres	4 cyl	gas
Diphenylmethane 99%	Aldrich Chemical	500 g	liquid

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07/14/89

TABLE 1

Laboratory Reagent Inventory

CHEMICAL NAME =====	COMPANY =====	QTY ===	STATE =====
Diphenylthiocarbazone	Fisher Scientific	25 g	solid
Eosin Y	Aldrich Chemical	25 g	solid
Ether anhydrous	Fisher Scientific	4 qt	liquid
Ethoxyguin	unknown	4 oz	liquid
Ethyl acetate	Aldrich Chemical	5 gal	liquid
Ethyl acetate	MCB	5x1gal	liquid
Ethyl benzene	Dupont	1 qt	liquid
Ethyl ether 99%	Fisher Scientific	6x500g	liquid
Ferric ammonium sulfate	Fisher Scientific	500 g	solid
Ferric chloride	unknown	100 ml	liquid
Ferric chloride	Fisher Chemical	1 lb	solid
Ferric chloride anhydrous	Pennwalt Corporation	5x500g	solid
Ferric chloride anhydrous	Kodak	500 g	solid
Ferrous ammonium sulfate	Fisher Chemical	1 lb	solid
Formic acid	unknown	200 g	liquid
Glacial acetic acid	Fisher Chemical	5 lb	liquid
Hydrazine sulfate	Fisher Scientific	4 oz	solid
Hydrazine sulfate	Fisher Scientific	100 g	solid
Hydrochloric acid	MCB	2x6 lb	liquid
Hydrochloric acid	Fisher Chemical	3x1 L	liquid
Hydroxylamine hydrochloride	Fisher Scientific	1 kg	solid
Hydroxylamine hydrochloride	MCB	4 oz	solid
Iodine	Fisher Scientific	500 g	solid
Iron chloride anhydrous	BASF	500 g	solid
Isoamyl alcohol	Fisher Scientific	500 ml	liquid
Isobutyl alcohol	J.T.Baker Chemical	500 ml	liquid
Lead acetate	MCB	1 lb	solid
Lead nitrate	Fisher Scientific	100 g	solid
Lithium perchlorate	Aldrich Chemical	500 g	solid
Magnesium sulfate	Fisher Scientific	500 g	solid
Medical oxygen	MSA	1 cyl	gas
Mercuric chloride	Fisher Scientific	2x100g	solid
Mercuric oxide	Fisher Scientific	500 g	solid
Mesityl oxide	Aldrich Chemical	100 g	solid
Methanol	Fisher Scientific	4 L	liquid
Methenamine	Fisher Scientific	500 g	solid
Methyl alcohol	Mallinckrodt	1 gal	liquid
Methyl orange	Fisher Scientific	113 g	
Methyl red	Fisher Scientific	2x10 g	solid
Monochlorobenzene	PPG Industries	10 oz	liquid
N-methylaniline	Kodak	1 kg	liquid
Na salt of ME salicylate	Sattra Chemical	1 bag	solid
Niacin N.F.	Nepera Chemical	250 g	solid
Nitric acid concentrated	J.T.Baker Chemical	2x8 lb	liquid
Nitrobenzene	Fisher Scientific	1 qt	liquid

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TABLE 1

Laboratory Reagent Inventory

CHEMICAL NAME =====	COMPANY =====	QTY ===	STATE =====
Non aqueous buffer soln.	Beckman Instruments	1 pt	liquid
Nutrizyme	Merck	2 oz	solid
Oil #3	Frich Oil	5 gal	liquid
Paraffin oil	Fisher Scientific	1 qt	liquid
Paraformaldehyde	MCB	1 qt	liquid
Paraformaldehyde prills 91%	Celanese Chemical	1 lb	solid
Perchloric acid	MCB	2x8 lb	liquid
Phenol red	Fisher Scientific	5 g	solid
Phenophtalein	Fisher Scientific	1 oz	solid
Phenylhydrazine	Fisher Scientific	4x4 oz	liquid
Phenylhydrazinehydrochloride	Fisher Scientific	2 lb	solid
Phosphorous pentoxide	Fisher Scientific	1 lb	solid
Piperazine	MCB	100 g	solid
Potassium bromide	Fisher Scientific	5x500g	solid
Potassium butoxide	Callery Chemical	50 g	solid
Potassium chloride	Beckman Instruments	2x6 oz	solid
Potassium cyanate	Fisher Scientific	1 lb	solid
Potassium cyanide	Fisher Scientific	500 g	solid
Potassium dichromate	Fisher Scientific	500 g	solid
Potassium ferrocyanide	Fisher Scientific	3 kg	solid
Potassium hydroxide	Mallinckrodt	2x1 lb	solid
Potassium hydroxide	Fisher Scientific	500 g	solid
Potassium iodide	Drew Chemical	1 qt	liquid
Potassium iodide	Fisher Scientific	2x500g	solid
Potassium periodate	Fisher Scientific	100 g	solid
Potassium platinate	Varlacold Chemical	5 g	solid
Potassium sulfate	Indiana Army Ammo Plant	250 g	solid
Potassium sulfate	Aldrich Chemical	500 g	solid
Potassium sulfate	unknown	50 g	solid
Potassium thiocyanate	Fisher Scientific	500 g	solid
Resorcinol	Koppers	3 bags	solid
Salicylaldehyde 99+%	Aldrich Chemical	100 g	liquid
Salicylic acid	Aldrich Chemical	100 g	solid
Salicylic acid	Aceto Chemical	500 g	solid
Salicylic acid sodium salt	Aldrich Chemical	100 g	solid
Sicapent	MCB	2.8 L	solid
Silica gel dessicant	Davison Chemical	2x1 qt	solid
Silver nitrate	J.T.Baker Chemical	1 oz	solid
Silver nitrate	Sargent Welch Scientific	30 g	solid
Sodium Chloride	Fisher Scientific	500 g	solid
Sodium acetate	Sattra Chemical	3 bags	solid
Sodium acetate anhydrous	Niacet Corporation	250 g	solid
Sodium acetate anhydrous	CDF Chimie Noth America	2x500g	solid
Sodium amide	Farchan Research Lab	500 g	solid
Sodium benzoate	Sattra Chemical	1 bag	solid

07/14/89

TABLE 1

Laboratory Reagent Inventory

CHEMICAL NAME =====	COMPANY =====	QTY ===	STATE =====
Sodium benzoate	Dastech International	1 bag	solid
Sodium benzoate	Ishihara Corporation	250 g	solid
Sodium benzoate	Pfizer	100 lb	solid
Sodium borohydride	Fisher Scientific	4x25 g	solid
Sodium carbonate	Fisher Scientific	1 kg	solid
Sodium carbonate anhydrous	Mallinckrodt	1 lb	solid
Sodium chlorate	Hooker Chemical	1 box	solid
Sodium dichromate	Fisher Scientific	10 kg	solid
Sodium formate	unknown	5 lb	solid
Sodium hydride	Thiokol/Ventron Division	1 lb	solid
Sodium hydroxide	Mallinckrodt	500 g	solid
Sodium metal	RMI	2 boxs	solid
Sodium nitrite	Fisher Scientific	2x500g	solid
Sodium nitro ferricyanide	MCB	4 oz	solid
Sodium sulfate	Fisher Scientific	500 g	solid
Sodium tartrate	J.T.Baker Chemical	2 oz	solid
Sodium tartrate	Fisher Scientific	6x113g	solid
Sodium thiosulfate	Fisher Scientific	2x1 lb	solid
Succinic anhydride	MCB	6x250g	solid
Succinic anhydride	Aldrich Chemical	2x1 kg	solid
Sulfamic acid	Fisher Scientific	500 g	solid
Sulfanilic acid	H&S Chemical	1 bag	solid
Sulfite O,P,Q	Mogul Corporation	3x2 oz	liquid
Sulfuric acid	J.T.Baker Chemical	10 lb	liquid
Tetraphenolboron sodium 99%	Aldrich Chemical	25 g	solid
Thiopene	Kodak	100 g	liquid
Total alkylinity indicator	Drew Chemical	1 qt	liquid
Tributyl borate	Aldrich Chemical	750 g	liquid
Trichloroethylene	Mallinckrodt	1 pt	liquid
Triethyl borate 97%	Aldrich Chemical	100 g	liquid
Triethylenediamine	Air Products	250 g	solid
Uranyl acetate	unknown	500 g	solid
Weedox C/R 250 herbicide	Southern Mill Creek Prod.	2x5gal	liquid
Xylene	Fisher Scientific	5x1 L	liquid
Zinc chloride	Fisher Scientific	500 g	solid
Zinc chloride anhydrous	Mineral Research	1 lb	solid
p-chlorobenzene sulfonamide	H&S Chemical	2 bags	solid
p-naptholbenzein	Fisher Scientific	25 g	solid
p-toluenesulfonicmonohydrate	Aldrich Chemical	500 g	solid
pH indicator A	Mogul Corporation	2 oz	liquid
z Miscellaneous unknowns	on site lab glassware	280bot	misc.
z Miscellaneous unknowns	on site one oz bottles	238bot	liquid

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TABLE 2

Drum Inventory

Chemical Name =====	Company =====	Qty ===	State =====	Cond =====	Dates =====
Acetone	Ashland Chemical	55 G	liquid	good	
Acetylene	VI Gas	2 cyl	gas	good	
Activated carbon	Calgon Corporation	30 bag	solid	good	
All-weather patch material	Revere Chemical	55 G	solid	fair	
Amersite 2	Valley Freight Syst.	55 G	liquid	fair	
Ashland MeOH	Ashland Chemical	5 G	liquid	good	
Benzyl acetate	Island Chemical	21x55G	liquid	fair	
Benzyl chloride	Velsicol Corporation	28x55G	liquid	fair	
Chlorine	VI Gas	1 cyl	gas	poor	
Chloroform	unknown	55 G	liquid	good	
Crofox	Cerfact Laboratories	55 G	liquid	poor	
Crystal Clear floor finish	Cerfact Laboratories	2x20 G	liquid	good	
Degreaser	unknown	55 G	liquid	good	
Drewtrol 8500	Valley Freight Syst.	55 G	liquid	poor	
Ethyl alcohol	unknown	115x55	liquid	poor	
Filteraid	unknown	10x30G	solid	poor	
Glacial acetic acid	Celanese Chemical	13x55G	liquid	good	
Glycol	Island Chemical	20x55G	liquid	poor	1984
Humisorb	Culligan	30 G	solid	fair	
Hydrochloric acid	Certified Laboratory	55 G	liquid	poor	
Hydrogen chloride	VI Gas	1 cyl	gas	poor	
Insulation (asbestos??)	unknown	13 box	solid	good	
Insulation fiberglass	unknown	7 box	solid	good	
Lubricating oil	Texaco	2x10 G	liquid	good	
Lubricating oil	Texaco	5x55 G	liquid	good	
Magnesium sulfate trihydrate	Tomita Pharmaceutica	6x25kg	solid	fair	
Methanol	Ashland Chemical	5x55 G	liquid	good	
Methanol	unknown	3x55 G	liquid	fair	
Methyl isobutyl carbinol	Van Waters & Rogers	12x55G	liquid	good	1984
Methyl isobutyl ketone	Ashland Chemical	55 G	liquid	good	

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TABLE 2

Drum Inventory

Chemical Name =====	Company =====	Qty ===	State =====	Cond =====	Dates =====
Micro media filter sheets	Ertel Engineering	18 box	solid	good	
Oxygen	VI Gas	3 cyl	gas	good	
Oxygen	Santa Maria Gases	1 cyl	gas	good	
Paints	unknown	44x5 G	liquid	fair	
Paints	unknown	53x1 G	liquid	fair	
Paints	International Paint	97x5 G	liquid	fair	
Paints	International Paint	21x1 G	liquid	fair	
Para-phenetidin	unknown	55 G	liquid	fair	1983
Pentosin	Deutsche Pentosin	20 L	liquid	fair	
Potassium acetate	Jarchem Industries	8x100#	solid	good	
Potassium sulfate	unknown	50 bag	solid	good	
Powdered filter media	Ionics	2 boxes	solid	good	
Propane	unknown	4 cyl	gas	good	
Purafil II	unknown	15x10G	solid	good	
Quinine sulfate	Kimafarma	20 G	liquid	good	
Rinseline injector fluid	Bob Chamber Ltd.	55 G	liquid	good	
Rout	Cerfact Laboratories	20 G	solid	poor	
Salicylic acid	Rhone-Poulenc	27drum	solid	good	
Salt	unknown	2x30 G	solid	good	
Soda ash	Allied Chemical	15x100	solid	poor	
Sodium acetate anhydrous	unknown	50 lb	solid	good	
Sodium acetate anhydrous	Jarchem Industries	200 lb	solid	poor	
Sodium bicarbonate	Stauffer Chemical	8x100#	solid	poor	
Sodium hexa-meta phosphate	FMC	200 lb	solid	good	
Sodium hydroxide	Mantek	55 G	liquid	poor	
Sodium hydroxide	Manuel del Valle Inc	12x55G	liquid	good	
Spent toluene/acetone	unknown	2x55 G	liquid	fair	
Sterling salt crystals	unknown	50 lb	solid	poor	
Sulfamic acid	Dupont	400 lb	solid	poor	
Tartaric acid	Pfizer Chemical	15x100	solid	poor	
Thinner	unknown	6x1 G	liquid	fair	

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TABLE 2

Drum Inventory

Chemical Name =====	Company =====	Qty ===	State =====	Cond =====	Dates =====
Thinner	Advance	55 G	liquid	fair	
Toluene	Ashland Chemical	3x55 G	liquid	fair	
Toluene	unknown	5x55 G	liquid	good	
Triethylamine	Air Products	55 G	liquid	good	1984
Waste oil	unknown	2x55 G	liquid	good	
z Empty drums	unknown	130	n/a	fair	
z Miscellaneous unknowns	on site containers	25	misc.	poor	

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REFERENCE NO. 6

100529

REPORT ON
CURRENT GROUNDWATER CONDITIONS
IN THE U.S. VIRGIN ISLANDS

APRIL 1983

Prepared for the Government of the U.S. Virgin Islands
Department of Conservation and Cultural Affairs

Geraqhty & Miller, Inc.
Consulting Ground-Water Geologists and Hydrologists
North Shore Atrium
6800 Jericho Turnpike
Syosset, New York 11791

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The cooperation of the Department of Public Works was essential to the successful testing and sampling of the public-supply well fields on St. Croix. Commissioner Arnold Golden lent invaluable assistance in the form of his expertise and allocation of personnel. Members of Commissioner Golden's staff who assisted during this phase of the field work included Mr. Esdelle Hansen, Mr. Mirko Restovic, and Mr. Mendez and his well-field crew.

Mr. Harold Rolle of the Virgin Islands Housing Authority coordinated several aspects of the investigation on St. Thomas. Ms. Andrea Sklarew of the Environmental Protection Agency provided continuous support and insight throughout the entire project.

EXECUTIVE SUMMARY

As a basis for preparing a groundwater management program for the U.S. Virgin Islands, Geraghty & Miller, Inc., assessed groundwater conditions in St. Croix and St. Thomas. This report presents the findings of the technical investigation carried out in the first half of 1982. Recommendations for management of the groundwater resource are presented in the Groundwater Management Plan for the U.S. Virgin Islands, a document being submitted separately.

The major emphasis of the technical investigation focused on public-supply well fields on St. Croix. The Kingshill Limestone in central St. Croix and the alluvial deposits in valleys are the most prolific groundwater-producing formations. Most groundwater on St. Croix is mineralized and contains chloride and total dissolved solids concentrations in excess of USEPA drinking water standards. The salinity of groundwater usually increases with increasing depth and proximity to the sea.

Well construction and operational practices in St. Croix's public-supply well fields are not fully adequate to insure the quality and quantity of the groundwater resource. Record-keeping procedures are similarly insufficient. Controlled pumping tests were carried out at the Fairplain and Barren Spot well fields. Sewage odors were detected in some of the wells in the Fairplain well field. Evaluation of historical water-quality trends at the Fairplain well field indicates a direct relationship between pumpage and salinity of groundwater.

The limestone aquifer penetrated at the Barren Soot well field is one of the more permeable formations on St. Croix, and there is a possibility that additional groundwater can be developed in this area. Barium concentrations in excess of the USEPA drinking water standard of 1.0 mg/L and pentane were detected in water samples from Barren Soot wells. Prior to increasing the groundwater withdrawal at Barren Soot, field studies should be carried out to assess potential groundwater contamination from saline water and petroleum products.

Water samples were collected from 78 public-supply and private wells on St. Croix for inorganic analysis. A zone of groundwater high in total dissolved solids exists along the central portion of the south coast, and a zone of highly mineralized groundwater is present in the north-central part of the island. There are two zones of groundwater with elevated nitrate concentrations: the Cruzan Run-airport-Negro Bay area, and the Barren Soot-Ruhy-Zion Farm area. The exact number and the condition of private wells in St. Croix is uncertain: inadequate well construction practices and deterioration of some wells may be exposing key aquifers to contamination. Areas on St. Croix with a potential for future groundwater development have been identified.

In St. Thomas, groundwater resources in the upper Turpentine Run basin are heavily exploited. Wells in the upper Turpentine Run basin derive water from fracture zones and weathered portions of volcanic rock formations. Groundwater appropriations awarded in the upper basin are currently in excess of 1,000,000 gallons per day, but the actual daily pumpage is not known.

Nitrate concentrations in excess of the USEPA drinking water standard were detected in the water from Virgin Islands Housing Authority (VIHA) wells at the Tutu project. Organic solvents were detected in a water sample from one VIHA well. A limited well sampling program was carried out in the upper Turpentine Run basin. Chloride concentrations in groundwater in the upper basin are generally below USEPA drinking water standards. Total dissolved solids concentrations are usually in excess of the USEPA drinking water standard.

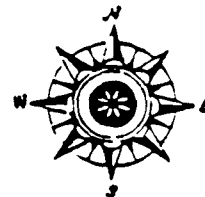
REPORT ON
CURRENT GROUNDWATER CONDITIONS
IN THE U.S. VIRGIN ISLANDS

INTRODUCTION

In December 1981, the Department of Conservation and Cultural Affairs (DCCA) of the U.S. Virgin Islands retained Geraghty & Miller, Inc., groundwater consultants, to assess the present condition of the groundwater resources of the Territory and to establish a groundwater management program. The primary objectives of this program are to protect the quality of the groundwater in the U.S. Virgin Islands and to maximize the long-term productivity of the resource.

As a basis for preparing the groundwater management program which will be the second phase of this project, Geraghty & Miller, Inc., carried out a preliminary assessment of groundwater conditions on St. Croix and St. Thomas (see Figure 1). Limitations imposed by budget and time precluded studying every public-supply well field in the Virgin Islands in detail.

Of the three principal U.S. Virgin Islands, St. Croix has experienced the greatest development of its groundwater resources and therefore received more emphasis throughout the investigation. The island of St. John apparently has sufficient water supply to satisfy the present demands of its inhabitants. Since the water-supply issue is not a critical issue as it is in the two more heavily populated islands, the groundwater resources of St. John were not assessed in detail during this study. Two well fields



ATLANTIC OCEAN

ANEGADA

UNITED KINGDOM
UNITED STATES

TORTOLA

VIRGIN
GORDA

ST. THOMAS

ST. JOHN

CULEBRA

PUERTO RICO

VIEQUES

CARIBBEAN SEA

ST. CROIX

0 10 20 30 40 miles

SUBJECT

LOCATION OF
THE U.S. VIRGIN ISLANDS

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PREPARED FOR

GOVERNMENT OF U.S. VIRGIN ISLANDS—
CONSERVATION AND CULTURAL AFFAIRS

Geraghty & Miller, Inc.	COMPILED BY	DANIEL NACHMAN	SCALE	FIGURE 1
	PREPARED BY	BILL CICIO	SHOWN	
	PROJECT MGR	WILLIAM BOIS	DATE	
			2/83	

on St. Croix and one on St. Thomas were selected for controlled test pumping. The other public-supply well fields on Croix were studied in less detail. A well sampling program was carried out to map water-quality zones in central and western St. Croix and the Tutu basin on St. Thomas.

Recommendations for rectifying the critical groundwater quality problems and obtaining the maximum benefit from the available groundwater resources in the Territory are presented in the Groundwater Management Plan for the U.S. Virgin Islands. This management plan is submitted as a separate document.

PREVIOUS WORK

The geology of the three major U.S. Virgin Islands has been studied and mapped in considerable detail (Donnelly, 1966; Whetten, 1966). The water resources of St. Thomas and St. John have been addressed in separate reports compiled by the U.S. Geological Survey (USGS) (Jordan and Cosner, 1973; Cosner, 1972). Each of these reports included an evaluation of the groundwater potential of the respective islands. The Turpentine Run basin (which includes the heavily populated Tutu area) on St. Thomas has been the subject of more detailed groundwater studies (Adams and Associates, 1978; Reed and Robison, 1972).

The groundwater resources of St. Croix have been investigated in greater detail. Earlier studies (Cederstrom, 1950; Tippetts, Abbett, McCarthy, Stratton, 1959; Hendrickson, 1963) inventoried the existing wells and interpreted the available geologic, hydrologic, and water-quality information. Cederstrom (1950) summarized the results of a test well drilling program carried out by the Civilian Conservation Corps in 1940-41 at various locations on St. Croix. Hendrickson (1963) evaluated six public-supply well fields, conducted pumping tests, and made recommendations for water-level and water-quality monitoring.

Two studies of St. Croix's groundwater resources were published by the USGS in the early 1970's. Robison (1972) evaluated the groundwater in central St. Croix, identified areas for future exploration, and proposed various schemes for utilizing the brackish water reserves in the Kingshill Limestone. Jordan (1975) authored a more detailed study of the hydrogeology of

St. Croix, including water-table maps, cross-sections based on well logs, and maps delineating groundwater quality zones on the island. The USGS has also compiled surface-water and groundwater data for the period of 1962 to 1969 for all three Virgin Islands (Robison, et al, 1973).

The consulting firm of Black, Crow, and Eidsness, Inc., submitted a water management plan for St. Croix to DCCA (Black, Crow, and Eidsness, Inc., 1976). That plan included a history of the development of water resources on the island, and an evaluation of well drilling practices and groundwater conditions. N. Krisen Buros, then of Black, Crow, and Eidsness, Inc., and now with CH₂M Hill, investigated the feasibility of recharging the groundwater in the Golden Grove area with treated wastewater (Buros, 1976). As part of that study, Buros collected water-level and groundwater-quality data in the River Gut basin from 1971 to 1975.

HYDROGEOLOGIC FRAMEWORK OF ST. CROIX

The geology and groundwater resources of St. Croix have been studied by several investigators, as summarized in the previous section. Cederstrom (1950) prepared a geologic map of the island, on which he located the wells in existence at that time. Whetten (1966) presented a more detailed analysis of the geology and geologic history. Figure 2, adapted from Whetten's (1966, 1974) maps, depicts the major geologic formations exposed on St. Croix.

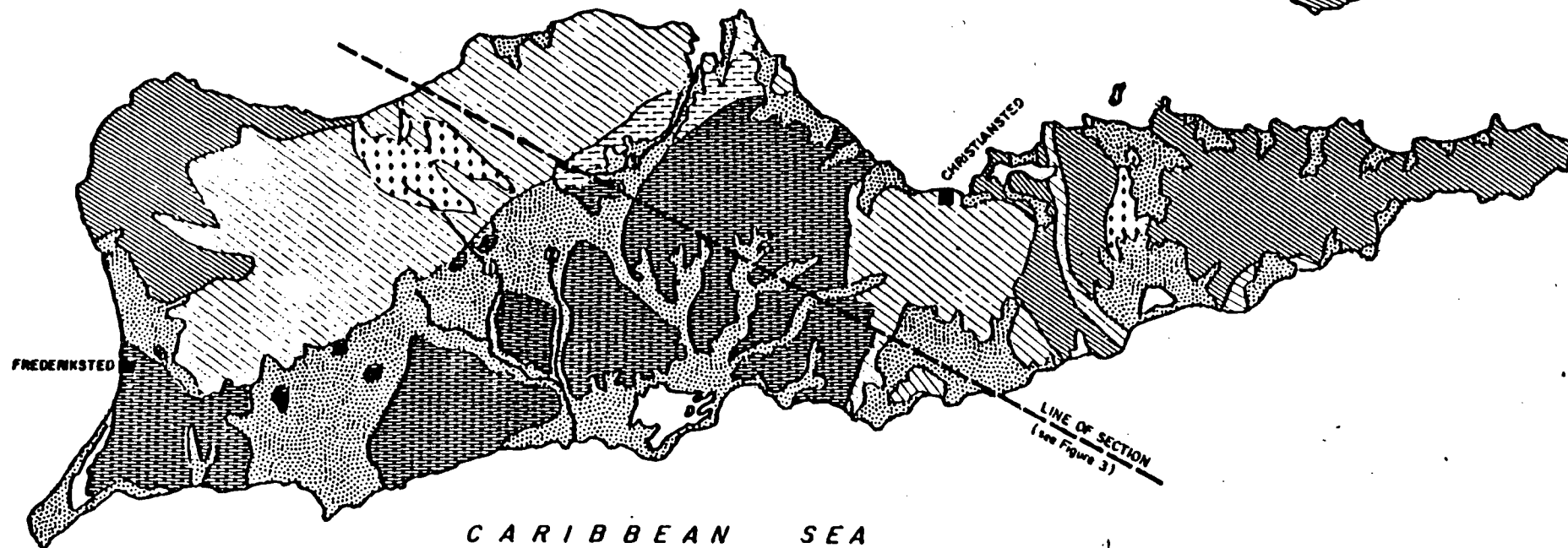
Cretaceous Formations

The oldest rocks exposed on St. Croix are sedimentary rocks of late Cretaceous age. These rocks are composed of sediment derived from eroding volcanic rocks and volcanic ash and debris (Whetten, 1974). Whetten (1966) referred to these Cretaceous rocks as the Mount Eagle Group and recognized several distinct formations. The oldest unit, the Caledonia Formation, is composed of thin, alternating mudstones, siltstones, and sandstones, presumably deposited by turbidity currents in a deep ocean basin. The Caledonia turbidites grade laterally and upward into several formations that are characterized by tuffs, tuffaceous sandstones, and siliceous mudstones, with a few thin limestone beds. These formations are, from oldest to youngest, the Allendale, Cane Valley, and Judith Fancy Formations.

The late Cretaceous rocks underlie the topographically high areas in the eastern third of the island and the Northside Range that forms the steep hills in the northwest. These older rocks have experienced intense



C A R I B B E A N S E A



0 1 2 MILES

EXPLANATION

-  ALLUVIUM AND BEACH DEPOSITS
-  KINGSHILL AND YOUNGER LIMESTONE
-  JEALOUSY FORMATION
-  TUFFACEOUS FORMATIONS
-  CALEDONIA FORMATION
-  INTRUSIVE IGNEOUS ROCKS

- ① RIVER GUT
- ② BETHLEHEM GUT
- ③ SALT RIVER

NOTE: MODIFIED AFTER WHETTEN
(1966, 1974)

SUBJECT

GENERALIZED GEOLOGIC MAP OF ST. CROIX

PREPARED FOR

GOVERNMENT OF U.S. VIRGIN ISLANDS--
CONSERVATION AND CULTURAL AFFAIRS

Geraghty
& Miller, Inc.

COMPILED BY DANIEL NACHMAN
PREPARED BY BILL CICIO
PROJECT MGR WILLIAM BOIS

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FIGURE
2

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tectonic activity. Strata are usually steeply inclined and are transected by several sets of fractures and small-scale faults. Several anticlines and synclines, and at least one thrust fault, have been identified in the late Cretaceous sequence (Whetten, 1974).

The permeability of the late Cretaceous sedimentary rocks is generally low: groundwater movement is mostly restricted to zones of fractures and joints. Wells drilled in these formations usually yield very modest amounts of water, yields being greatest where alluvial deposits overlie the bedrock (Jordan, 1975). The quality of water in these rocks is reported to be generally good in the central mountains. In coastal areas and in the easternmost third of the island, the groundwater tends to be brackish (Cederstrom, 1950; Jordan, 1975).

Intrusive Rocks

The late Cretaceous rocks have been intruded in two places by igneous rocks. These intrusions, the Fountain Gabbro in the northwest and the Southgate Diorite in the east, weather easily, and prominent valleys have formed where they are exposed (Whetten, 1974). The area underlain by the Fountain Gabbro has a mantle of alluvium and deeply weathered rock and yields moderate amounts of water to wells. Previous sampling programs have indicated that the quality of the groundwater in the gabbro is generally very good in comparison to that of the groundwater in the rest of the island (Jordan, 1975). The groundwater in the Southgate Diorite is reported to be more highly mineralized, particularly in the vicinity of the salt ponds located on the north and south shores. The yields of wells drilled

in the Southgate Diorite are not as high as those in the Fountain Gabbro (Jordan, 1975).

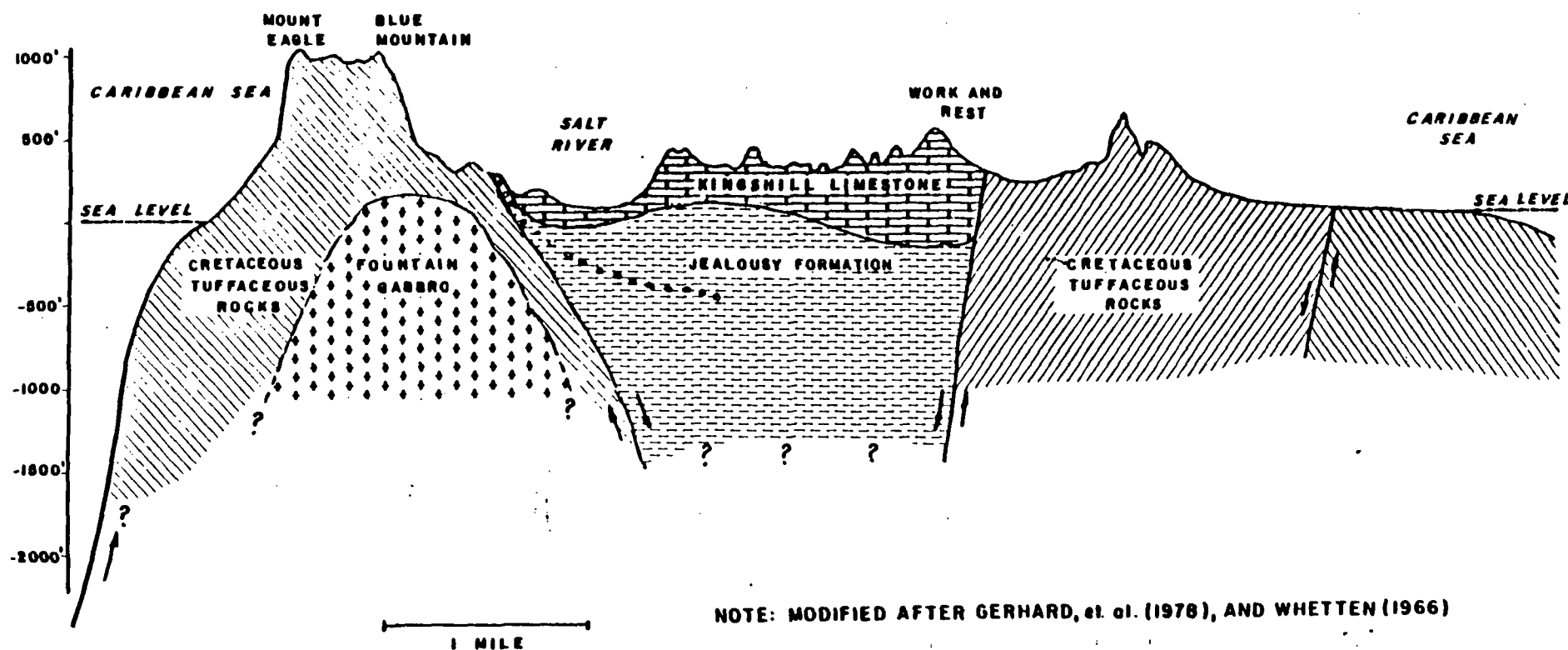
Jealousy Formation

The geologic structure of St. Croix's central valley is that of a graben, a downthrown block formed by normal faulting in the middle (and perhaps early) Tertiary (Whetten, 1966). During that time St. Croix consisted of two islands of deformed Cretaceous rocks separated by a marine basin, or "seaway" (Multer, et al., 1977), in which as much as 7,000 feet of sediment accumulated (see Figure 3).

Deposited unconformably on the late Cretaceous rocks is the Jealousy Formation of Oligocene age. The Jealousy Formation, in the few exposures along the southern flank of the Northside Range, is characterized by calcareous conglomerates. These poorly stratified sediments consist of pebbles and cobbles of tuffaceous sandstone and diorite, pockets of clay, and a calcareous, clayey, sandy matrix (Whetten, 1966). The conglomerates grade into a thick sequence of clay to the south. Two test wells drilled during Cederstrom's investigation at Jealousy and Bethlehem penetrated clay and conglomerate below the Kingshill Limestone. The test well at Bethlehem, in the middle of the central valley, penetrated 1,400 feet of clayey strata of Oligocene age, with only two thin (5 and 16 feet) layers of conglomerate (Cederstrom, 1950). The clays are nowhere exposed on the surface, but cuttings from the test wells have been studied for their microfossils and clay mineralogy. Whetten (1966) suggested that the bulk of the clay was derived from the alteration of volcanic ash deposited in the sub-

NORTHWEST

SOUTHEAST



NOTE: MODIFIED AFTER GERHARD, et. al. (1978), AND WHETTEN (1966)

EXPLANATION

-  KINGSHILL LIMESTONE
-  JEALOUSY FORMATION (CLAY WITH CONGLOMERATE LENSES)
-  CRETACEOUS TUFFACEOUS FORMATIONS
-  FOUNTAIN GABBRO (INTRUSIVE)
-  FAULT

SUBJECT

**SCHEMATIC NORTHWEST-SOUTHEAST
GEOLOGIC CROSS-SECTION OF
ST. CROIX**

PREPARED FOR

**GOVERNMENT OF U.S. VIRGIN ISLANDS--
CONSERVATION AND CULTURAL AFFAIRS**

Geraghty
& Miller, Inc.

COMPILED BY DANIEL NACHMAN
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FIGURE
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siding marine basin, and that the volcanic source may have been located to the south or southeast. The bottom of the Jealousy clays was not encountered, hence the maximum thickness of the Jealousy Formation is not known. A gravity survey (Shurbert, et al., 1956) indicated that the central valley is approximately 7,000 feet thick, but nothing is known of the sediments that lie below the Jealousy clays penetrated in the Bethlehem test well.

Jordan (1975) and Cederstrom (1950) both described the Jealousy as "not a water-bearing formation". Jordan indicated that the exposed conglomerate has a low permeability and contains brackish to saline groundwater. Hendrickson (1963) stated that the conglomerate "appears to be moderately permeable" where exposed in outcrop, but noted the test well drilled at Jealousy under Cederstrom's supervision yielded no water from the Jealousy conglomerates. Both Hendrickson and Jordan stressed Cederstrom's assertion of the hydrologic importance of the thick sequence of Jealousy clays, as it may serve to restrict the upward flow of saline water into the overlying Kingshill Limestone. In practice well drillers on St. Croix consider the top of the Jealousy Formation as the effective lower limit for water wells.

Kingshill Limestone

Limestones, chalks and marls of Miocene age overlie the Jealousy Formation and are exposed over much of St. Croix's central valley. This carbonate sequence attains a thickness of 600 feet in places in the western part of the valley, but in most areas is considerably thinner, due to erosion. Most authors (Cederstrom, 1950; Whetten, 1966; and others) have re-

ferred to all of the carbonate rocks exposed on St. Croix as the Kingshill Marl. Recent work (Gerhard, et al., 1978; Multer, et al., 1977) has identified relatively thin deposits of younger reef limestones of late Miocene or Pliocene age deposited unconformably on the Miocene limestones and marls. Gerhard, et al., (1978) have, therefore, proposed the name Kingshill Limestone for the volumetrically more important carbonates of early middle Miocene age.

The Kingshill Limestone comprises several different interbedded lithologies. Surface exposures and well logs indicate three dominant rock types: sandy to conglomeratic marls composed of terrigenous material and calcareous skeletal debris; indurated chalks of pelagic biogenic origin; and calcarenites (calcareous sandstones) deposited in a shelf or near-reef environment (Multer, et al., 1977; Gerhard, et al., 1978). The chalks and marls form the dominant lithology over most of the exposed area of the Kingshill Limestone, particularly in the upper part of the sequence, and in the area west of River and Bethlehem Cuts (see Figure 2). The calcarenite, the most permeable of the Kingshill facies, is more predominant in the southeast portion of the central valley. Well logs indicate that the proportion of calcarenite increases with depth (Jordan, 1975). In general, the permeability of the chalks and marls is low, but solution cavities of various sizes have been identified at several localities, notably Paradise and Enfield Green (Cederstrom, 1950), the Frederiksted area (Jordan, 1975), and the Hess Oil refinery on the south coast (Gerhard, et al., 1978). The solution cavities in the Frederiksted and Hess areas attain diameters of 3 to 7 feet or larger.

The quality of water in the Kingshill Limestone is highly variable. In general, the salinity of the groundwater in the central valley increases with depth. Jordan (1975) indicates that in many areas in the central valley, the upper 50 feet of the saturated Kingshill Limestone may contain groundwater with less than 500 milligrams per liter (mg/L) of chloride, while at a depth of 150 feet below the water table, the concentration can exceed 3,000 mg/L. Almost all of the groundwater in the Kingshill Limestone contains chloride concentrations in excess of 250 mg/L and total dissolved solids (TDS) in excess of 500 mg/L, the maximum levels set in the USEPA secondary drinking water standards. In the cavernous sections of the Kingshill Limestone in the Frederiksted area, the groundwater is brackish (Jordan, 1975; Hendrickson, 1963). Jordan (1975) claimed there is a zone of highly saline groundwater at the foot of the Cretaceous hills along the northern edge of the central valley, particularly in the area of Mon Bijou. Jordan suggested that the high salinity of the groundwater in this inland area may be due to the presence of connate (fossil) sea water or upward migration of saline water from the Jealousy Formation.

Cederstrom (1950) stated that the Kingshill carbonates are in general a poor water-bearing formation. Wells drilled since Cederstrom's investigation indicate that the Kingshill Limestone is the most productive aquifer on St. Croix (Hendrickson, 1963; Robison, 1972). The maximum saturated thickness of the Kingshill Limestone is approximately 200 feet, and in certain areas, the formation can yield in excess of 100 gallons per minute (gpm) to wells screened over the full saturated thickness (Robison, 1972). The advantages of obtaining greater quantities of water from the deeper

portions of the Kingshill Limestone may be offset by the increase in salinity of the groundwater with depth. Robison estimated that the total amount of water stored in the Kingshill Limestone approaches 130 billion gallons, of which approximately one third has a total dissolved solids content under 6,000 mg/L. In general, the permeability of the carbonate sequence is lower in the middle of the central valley and greatest in the southeast (Jordan, 1975).

The Kingshill Limestone is the principal aquifer tapped by the public-supply well fields at Barren Spot, Concordia, and Negro Bay. Buos (1976) indicated that, in the Negro Bay area, the groundwater is under a considerable amount of artesian pressure, as a result of hard limestone layers that function as confining beds.

Alluvium

Recent alluvial deposits mantle much of the area underlain by the Kingshill Limestone and have filled in valleys eroded into the carbonate sequence. Alluvial deposits also attain considerable thickness in the valley along Mahogany Road north of Frederiksted and in the valleys underlain by the Fountain Gabbro and the Southgate Diorite. The thickest deposits of alluvium are located along the lower reaches of intermittent streams, notably Salt River and Bethlehem and River Guts (see Figure 3). The maximum thickness of the alluvial deposits is probably at the mouth of River Gut, where the alluvium is approximately 100 feet thick.

The alluvium is composed mostly of montmorillinitic clay of very low

permeability (Robison, 1972; Bueros, 1976). In some localities, it is difficult to distinguish the alluvial clay from the underlying and surrounding marl (Robison, 1972). Interbedded with the clay are thin (usually 2 to 4 feet) lenses of terrigenous sand and gravel. In general, the proportion of sand and gravel increases seaward, although pockets of coarse material were deposited at the foot of the Cretaceous hills where intermittent streams transect the limestone lowlands. The valleys that have intermittent surface drainage (Salt River, Bethlehem Gut, River Gut) have a higher percentage of sand and gravel, while valleys with no surface drainage (Barren Spot, Castle Coakley) have a higher percentage of silty, marly clay and lower overall permeability in the alluvium (Jordan, 1975). The degree of interconnection of the sand and gravel lenses in the principal valleys is uncertain, but drilling programs have indicated that many layers of coarse material are isolated and limited in horizontal extent (Bueros, 1976).

Many private and public wells tap the alluvial deposits. The alluvium is the principal aquifer at the Fairplain, Golden Grove, and Adventure well fields, and to a large degree at Mahogany Road and La Grange as well. Yields from the alluvial aquifer are highly variable. Most of the groundwater in the alluvium appears to be under partially confined conditions. Cederstrom (1950) stated that the upper sand layers in the lower valley of River Gut contain groundwater under water-table, or unconfined, conditions, whereas the deeper sands exhibit artesian pressures. Bueros (1976) suggested that all of the water in the alluvium was confined and that there are probably no water-table aquifers on St. Croix.

The quality of the water in the alluvium is generally good to fair (Hendrickson, 1963). Drought conditions or prolonged pumping of wells tapping alluvial deposits usually cause a deterioration in water quality, especially in coastal areas. Deterioration of the quality of inland alluvial aquifers is thought to be due to the introduction of more saline water from surrounding limestones (Jordan, 1975).

GENERAL CONDITIONS OF WELL FIELDS ON ST. CROIX

Seven well fields are currently operated and maintained by the Department of Public Works (DPW) for public water supply on St. Croix (Figure 4). The Fairplain, Negro Bay, and Golden Grove well fields are at times referred to as one well field for operational purposes; in this report each will be considered a separate unit.

Almost all of the wells used for public supply were drilled over the last 50 years by local well-drilling contractors with cable-tool drilling rigs. The wells have been constructed with 6- or 8-inch casing, usually perforated or slotted from the water table to the finished depth. The older wells were all constructed with steel pipe; in recent years plastic (PVC) has been installed in some of the wells drilled for public supply. The amount and quality of available hydrogeologic information varies for the individual well fields, but is generally sufficient to indicate the geologic nature of the water-bearing strata.

Historically, the collection of water-level and water-quality information has been sporadic, and much of the data are unreliable. Most of the reliable data have been derived from the studies cited in previous sections. Records regarding operational pumping rates and sustained yields of individual wells are usually not available. At present there appears to be no reliable method for determining the total daily or monthly pumpage from each well field.

St. Croix's public well fields currently provide a steady supply of

groundwater, but there are certain operational problems which should be addressed. DPW employees, by sounding the wells when pumps are repaired or changed, have noted a gradual, and in some cases significant, decrease in the depths of particular wells. Many of the older wells appear to have suffered considerable corrosion of the steel casing. As a result, some of these wells may have partially collapsed, causing a significant decrease in their yield. Wells in which the casing is still intact may have experienced substantial filling with silt and sand brought in to the well through the perforations in the casing. This infilling will have a detrimental effect on the yield of a well as a portion of the water-bearing zone is sealed off. The influx of sand and silt into the well can also cause serious damage to the internal parts of the installed pumps.

Subsidence of the ground surface around many wells has caused the cement base to crack, increasing the susceptibility of the wells and water-bearing formations to contamination. There are many old wells, particularly in the area between the Golden Grove and Fairplain well fields, that are no longer in use and have not been properly sealed. These old wells can act as passageways for surface contamination with direct access to important aquifers.

One serious problem, which has been dealt with only superficially or not at all in previous reports, is the accumulation of lubricating oil in the wells and at various points in the distribution system. At present, all but one well (Concordia-1) pumped for public supply on St. Croix are equipped with oil-lubricated, line-shaft pumps. Lubricating oil is leaking

into the wells due to malfunctioning lubricating systems: in some wells in the Fairplain and Barren Spot well fields as much as 8 feet of black oil was detected floating on top of the water in 1982. During the pumping tests in March 1982 in these two well fields and the sampling of other well fields, it was apparent that oil has accumulated at various points in the piping that carries water from the wells to the storage tanks in each well field. At some points the accumulation of coagulated oil and other debris may be severely restricting the flow of water through the piping. Oil has also coated the inside of many of the water storage tanks at the well fields. The periodic influx of lubricating oil into the potable water distribution system poses serious water-quality problems.

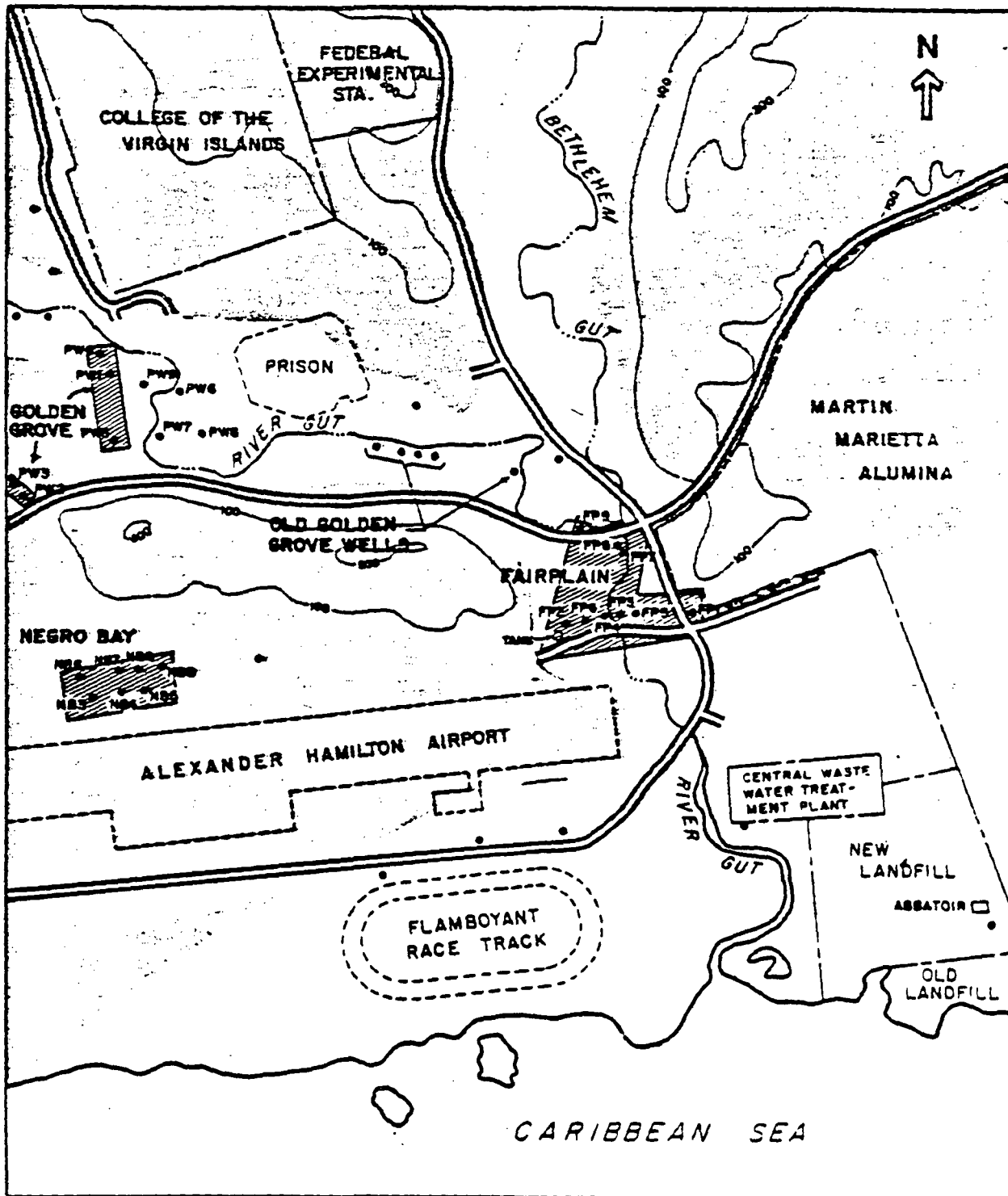
At present the construction of some of the older wells is such that accurate measurement of static or pumping water levels is not possible. Some of the wells installed in the last 20 years have an opening at the top or on the side of the cement base. These openings allow for measurement of static water levels in some cases, providing the measuring device can pass through the 45° bend at the top of the cement base. The lack of a sounding pipe that extends from the surface to the lowest possible pumping level precludes the accurate determination of the water level when the pump is operating, due to the cascading of water that can occur in a pumping well. In addition, the thick accumulation of oil in many of the wells interferes with the accurate measurement of water levels using standard electric devices, necessitating the use of a steel tape with chalk. The construction of most of the wells, however, does not provide sufficient access for a steel tape and weights.

Regular, accurate measurements of static and pumping water levels in the wells and periodic groundwater-quality analysis would enable DPW and DCCA to better assess changing groundwater conditions. Such data would also provide advance warning of declining pumping levels or increasing salinity that could cause damage to the installed pumps and other equipment.

FAIRPLAIN WELL FIELD

A controlled pumping test was carried out in the Fairplain well field in March 1982. The Fairplain well field is one of the major sources of groundwater for public supply and is located at the junction of two of the larger alluvial valleys in central St. Croix (see Figure 5). Due to its proximity to the sea, the Fairplain well field may be relatively susceptible to upconing or intrusion of sea water, and in fact, there have been several reports of individual wells "going salt" (Comm. A. Golden, pers. comm., 1982; Buros, 1976). The Fairplain well field is also susceptible to contamination that may originate from reported breaks in the sanitary sewer mains that are oriented parallel to the courses of River and Bethlehem Gut. Periodic operational problems at the central wastewater treatment plant, south of Fairplain, have resulted in the accumulation of untreated wastewater in the bed of River Gut south of the airport road (see Figure 5). Much of the lower course of River Gut, from the confluence with Bethlehem Gut to the ocean, resembles a series of ponds more than a stream, the ponding caused by localized accumulations of sediment and debris.

There are currently nine wells in the Fairplain well field (Figure 6). At the time of the field investigation and pumping test, five wells (FP-4, FP-5, FP-7, FP-8, and FP-9) were equipped with pumps and were operational. Several months later, pumps were reinstalled and connected to the distribution system in two additional wells (FP-1 and FP-6).



EXPLANATION

- ROAD
- INTERMITTENT STREAM
- PROPERTY BOUNDARY
- WELL LOCATION
- WELL NUMBER
- PUBLIC-SUPPLY WELL FIELD
- ALLUVIUM-FILLED VALLEY & COASTAL PLAIN
- OUTCROP OF KINGSHILL LIMESTONE

0 500 ft.

SUBJECT

GEOLOGY AND LOCATION OF WELLS IN FAIRPLAIN WELL FIELD AREA, ST. CROIX

100560

PREPARED FOR

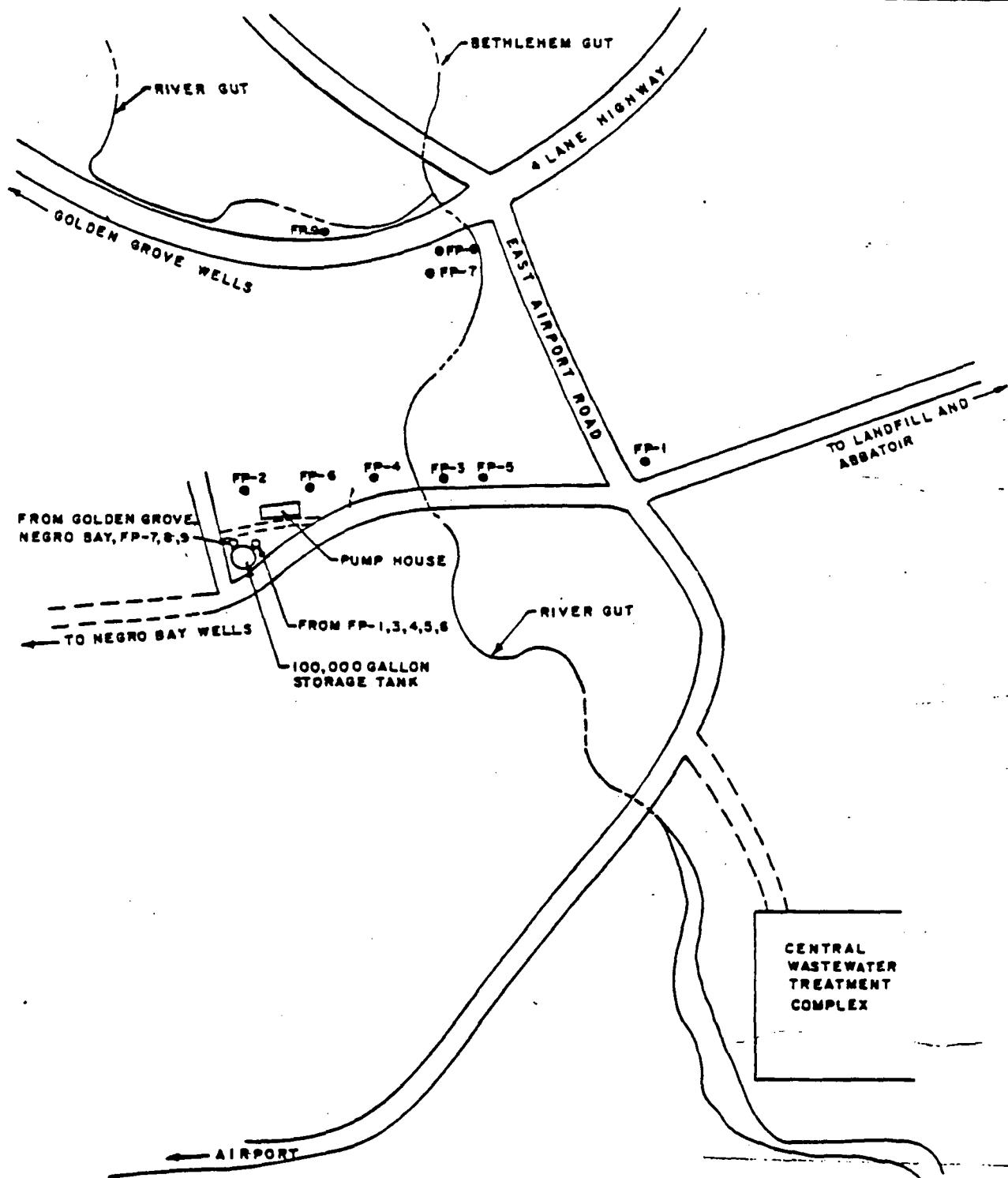
GOVERNMENT OF U.S. VIRGIN ISLANDS--
CONSERVATION AND CULTURAL AFFAIRS

Geraghty
& Miller, Inc.

COMPILED BY Daniel A. Nachman
PREPARED BY William H. Cicio
PROJECT MGR William Bois

SCALE
Shown
DATE
2/83

FIGURE
5



0 500 1000 FT

EXPLANATION

--- INTERMITTENT STREAM
 ● FP-5 WELL AND NUMBER
 INTAKE  STORAGE TANK

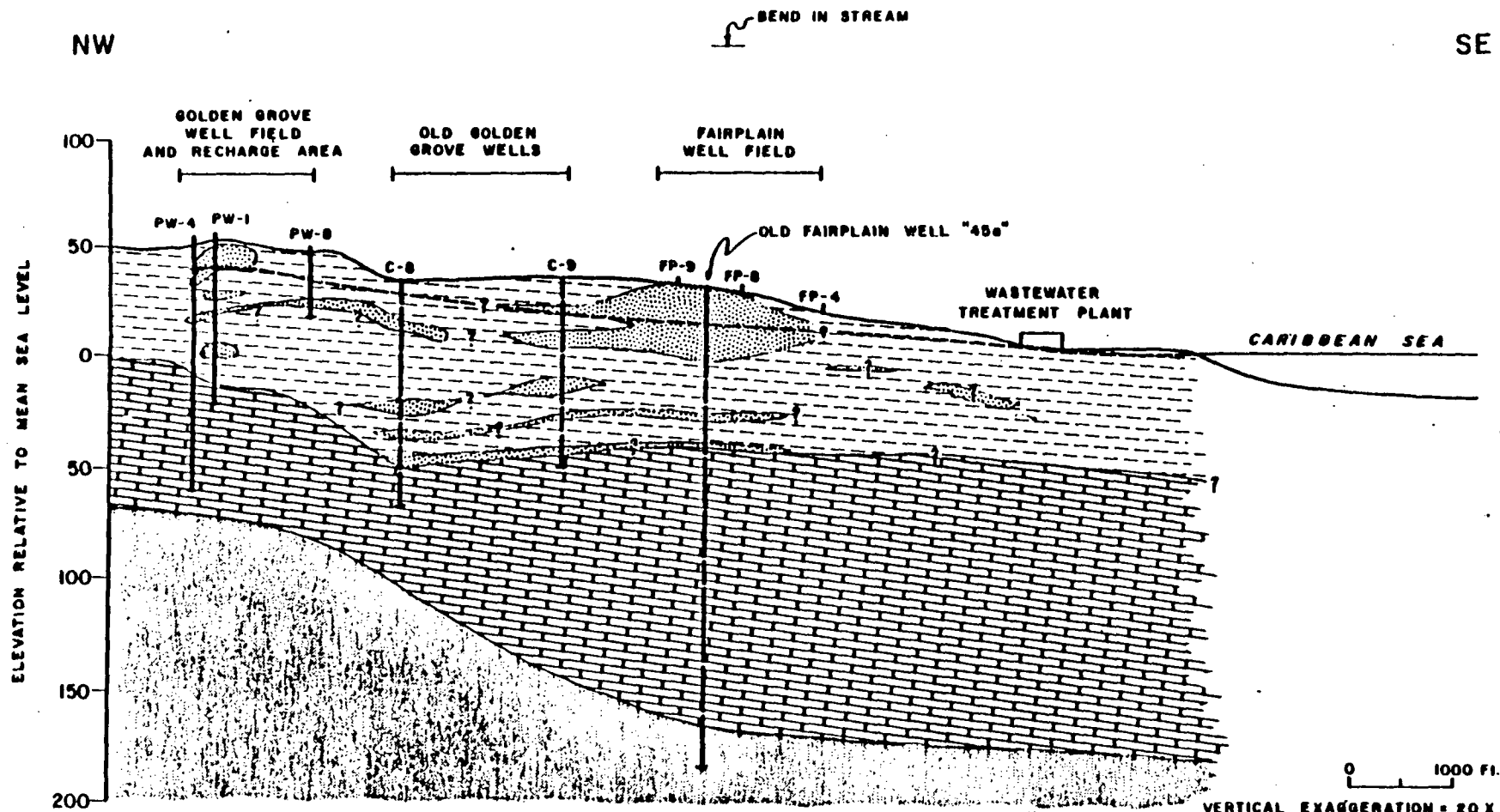
SUBJECT			
LOCATION OF WELLS, STORAGE TANK, AND PUMP HOUSE IN FAIRPLAIN WELL FIELD, ST. CROIX 100561			
PREPARED FOR			
GOVERNMENT OF U.S. VIRGIN ISLANDS— CONSERVATION AND CULTURAL AFFAIRS			
Geraghty & Miller, Inc.	COMPILED	DANIEL NACHMAN	SCALE
	PREPARED	BILL CICIO	SHOWN
	PROJECT MGR	WILLIAM BOIS	DATE
			FIGURE
			6

History of Groundwater Development

Cederstrom (1950) inventoried an unnamed well (45b) in the Fairplain area. This well, 58 feet deep, and apparently drilled prior to 1938, may be one of the existing wells currently identified as FP-7 and FP-8 (see Figure 6), or may have been abandoned long ago. Cederstrom supervised the drilling and installation of a well (45a) "near the existing well (45b)" sometime between 1938 and 1940. Well 45a was drilled to a depth of 225 feet penetrating 73 feet of alluvial clays, sands, and gravels, 125 feet of marl and limestone, and 17 feet of blue clay of the Jealousy Formation (see Figure 7). The exact location and current status of Well 45a is uncertain. Some investigators (Black, Crow, and Eidsness, Inc., 1976) have concluded that the existing Well FP-8 is Well 45a, but Well FP-8 was sounded prior to the March 1982 pumping test, and is currently only 60 feet deep. Long-time DPW employees have suggested that Well 45a was located somewhere to the north and west of current Well FP-8, and may have been covered during the construction of the new highway.

Cederstrom (1950) carried out a pumping test on Well 45a soon after it was drilled and developed. From the pump test, carried out for 52 hours at pumping rates ranging from 53 to 80 gpm, he calculated the specific capacity of the well to range from 4.52 to 5.55 gpm/ft. The well was put into service to provide water for the Bethlehem Sugar Factory north of Fairplain; in 1943 the well was reportedly being pumped at a rate of 40 gpm (Cederstrom, 1950).

Cedarstrom's report also summarized the results of a drilling program



—EXPLANATION—

- WELL NUMBER AND LOCATION
(No Longer Exists Where Dashed)
- LAND SURFACE
- APPROXIMATE WATER TABLE
- FORMATION CONTACT
- WELL TOTAL DEPTH
- SAND & GRAVEL } ALLUVIUM (RECENT)
- CLAY }
- KINGSHILL LIMESTONE (MIOCENE)
- JEALOUSY FORMATION-CLAY (OLIGOCENE)

SCHEMATIC HYDROGEOLOGIC CROSS-SECTION PARALLEL TO AXIS OF LOWER RIVER GUT			
PREPARED FOR GOVERNMENT OF U.S. VIRGIN ISLANDS-- CONSERVATION AND CULTURAL AFFAIRS			
Geraghty & Miller, Inc.	COMPILED BY Daniel A. Nachman PREPARED BY Geoffrey Schaffner PROJECT MGR William Bois	SCALE Shown DATE 9-82	FIGURE 7

100563

undertaken by the Civilian Conservation Corps (CCC) in 1941. Three test holes and three test wells were drilled "in the deep alluvium-filled valley 1/4 to 1/2 mile north of the Fairplain well (45a)" (Cederstrom, 1950). From this description, these wells were apparently drilled northwest of the current Fairplain well field. Buross (1976) has located several wells in the area of Estate Golden Grove (see Figure 5) and reports that several are no longer in use.

Later studies report that in the late 1950's, three wells in the area northwest of Fairplain were connected to supply water to the airport: at that time only one of these was being pumped at a rate of approximately 5,000 gallons per day (gpd) (Tippetts, Abbett, McCarthy, Stratton, 1959). As recently as 1962, only one well was inventoried in the area encompassed by the current Fairplain well field: this well was apparently in the vicinity of FP-8 or FP-9 (Hendrickson, 1963), and may be one of these two wells.

By 1972, all of the nine Fairplain wells currently operated by DPW were in existence. Of these, three wells (FP-1, FP-3, and FP-4) were reportedly drilled in 1970 (Black, Crow, & Eidsness, Inc., 1976). The date of installation of the remaining wells is uncertain. Unfortunately, accurate drilling logs for the nine existing wells were not available during the course of this investigation.

Currently, as many as seven wells in the Fairplain well field are pumped continuously. Wells are periodically taken out of service for repair of pumping equipment. During the period from 1972 to 1975, Wells FP-3, FP-6, and FP-4 were taken out of service because of high chloride content of

the water (Buros, 1976). Well FP-3 is still not pumped, but FP-4 has been pumped at least since 1980. Well FP-6 was reconnected to the system in May 1982. Well FP-2 was drilled as a test well some time prior to 1971 and went dry 10 minutes after test pumping began (Comm. A. Golden, pers. comm., 1982). This well has reportedly never been equipped with a permanent pump.

Hydrogeology

The Fairplain well field is located in the valley of River Gut, the largest intermittent stream on St. Croix. Eight of the nine Fairplain wells are situated downstream from the confluence of Bethlehem Gut and River Gut (see Figures 5 and 6). The valley is underlain by alluvium derived from the Cretaceous rocks that form the Northside Range of St. Croix (see Figure 2).

Based on logs of five wells drilled between 1938 and 1941 in the Fairplain area (Cederstrom, 1950) and well logs from the Golden Grove area (Buros, 1976), a hydrogeologic cross-section of the Fairplain area has been constructed (Figure 7). Three geologic formations underlie the valley of River Gut in this area. The uppermost deposit consists of alluvial clay, sand, and gravel and ranges from 73 to 83 feet in thickness in the center of the valley at Fairplain. The alluvium is underlain by limestones, chinks, and marls of the Kingshill Limestone. Most wells in the Fairplain area apparently terminate in the alluvium or the upper 20 feet of the Kingshill Limestone. One well (Well 45a), discussed in the previous section, was drilled to a depth of 225 feet (Cederstrom, 1950). In this well, the Kingshill Limestone was 125 feet thick and underlain by the Jealousy

Formation, composed of gray and blue clay. In the Bethlehem area north of Fairplain, a test hole found the Jealousy Formation to be over 1,300 feet thick (Cederstrom, 1950).

The wells in the Fairplain well field, and the Golden Grove area to the northwest, apparently derive all of their water from the sand and gravel layers present in the alluvium. Cederstrom (1950) stated that "no water-bearing strata were encountered in the limy rocks" that occur below the alluvium in the drilling of deep Well 45a. The existence of permeable zones in the Kingshill Limestone should not be ruled out, however, as water wells have been successfully completed in this unit in the Negro Bay area to the west and Barren Spot area to the east of Fairplain.

From the available well logs, the alluvium appears to be predominantly clay, with sand and gravel layers that generally range in thickness from 1 to 8 feet. The sand and gravel layers exhibit a variable degree of sorting, and many contain high percentages of clay. The degrees of interconnection of the sand and gravel layers is uncertain (see Figure 7). Bueros has tentatively suggested that at least two permeable layers extend from the Golden Grove well field along the stream bed to the Fairplain well field (Bueros, 1976, Figure 20, p. 47). Unfortunately, the available geologic information is insufficient to verify this interconnection, or to determine the exact dimensions of these permeable zones.

The presence of permeable strata in the upper part of the alluvial section at Fairplain (Figure 7) suggests that the water-bearing strata may be unconfined or semiconfined. Bueros stated that "Groundwater studies have

demonstrated that the potentiometric head throughout the valley reflects the confined condition of the water within the aquifer and does not represent a free water table. In most of the study area and the island in general, an unconfined water table does not exist" (Buros, 1976, p. 48). Cedarstrom (1950) felt that the upper layers of sand at Fairplain were unconfined, whereas the water in the deeper sands and gravels were under confined conditions. To accurately determine whether the alluvial sands and gravels at Fairplain behave as a water-table, semiconfined, or confined aquifer, carefully located monitoring wells screened in the various discrete water-bearing zones would have to be installed and monitored regularly. The size and configuration of the cones of influence of the Fairplain wells are parameters that would indicate the degree of confinement of the saturated alluvium. The results of the pumping test carried out in March 1982 indicate that the alluvial aquifer is under semiconfined conditions. The analysis of this pumping-test data is discussed in detail in a subsequent section.

Pumping Test

A controlled pumping test in the Fairplain well field was organized and carried out in March 1982 by Geraghty & Miller, Inc., with the continuous support of DCCA and DPW personnel. The pumping test began on March 9 at 5:00 PM and continued, in five stages, until 4:00 PM on March 10. Three wells were pumped during the test: the other six wells were used as observation points.

A considerable amount of preparatory work was necessary prior to the

Table 1. Depth of Wells. Water Levels, and Yield in the Fairplain Well Field, St. Croix

Well No.	Original Depth* (feet below land surface)	Sounded Depth 1982 (feet below land surface)	Static Water Level March 1982 (feet below top of casing)	Pumping Water Level (feet below top of casing)	Discharge (gpm)
FP-2	NA**	79	23.3	No pump	-
FP-6	NA	105	18.1	No pump	-
EP-4	100	Insufficient clearance	19.7	31.8	21
FP-3	100	97	13.5	No pump	-
FP-5	NA	96	18.6	25	10.4
FP-1	100	Insufficient clearance	20.9	No pump	-
FP-7	58	57	18.3	28.6	15.7
FP-8	NA	56	19	32.1	37.9
FP-9	NA	62	22.3	30.7	21

* Black, Crow and Eidsness, Inc., 1976.

** Not available

All measurements in feet below land surface.

REFERENCE NO. 7

100569

CONTROL NO.:

02-9101-04

DATE:

1/30/91

TIME:

1515

DISTRIBUTION:

- VI Chemical Fill

BETWEEN:

Alan HATKIN

OF:

VI OFFICE
USGS

PHONE:

(809) 778-0133

AND:

RICHARD JETTINO

(NUS)

DISCUSSION:

I asked AH about ^{ground} water use in St Croix. He told me that public water is obtained in 2 ways: ① desalinization just outside of Christiansted; and ② wells owned by VI Water and Power Authority (WAPA). From wells the water goes to holding tanks where it is chlorinated. The water from these 2 systems is sometimes mixed. He confirmed groundwater flow to be southeast in the area of the site. AH explained the temporary dams they are installing in the guts are to help artificially recharge the aquifer. The 8 observation wells they installed in the area are used to monitor this. AH said USGS just completed sampling all public supply wells on the island. He said the data is not all back yet and to see it I would have to speak to WAPA. He told me that he knows of the following ^{public supply} wells in use near the site: 1 well (Fairplanes #9) north of Rte 66 just west of site; 4 wells just above airport; 5 wells near bridge of Rte 66 and the USGS

ACTION ITEMS:

project. Others are upgradient from the site. He suggested I check 2 reports for geology information: ① Garbáty & Miller Report on VI; ② Survey of H₂O Resources in St Croix, VI -- 1975. He told me for further information on WAPA wells & water supply to call ELTON CHONGASING of WAPA on St Thomas (809) 775-5873. He also welcomed any further questions.

1/30/91

100570

REFERENCE NO. 8

100571

TABLE 2
PERMEABILITY OF GEOLOGIC MATERIALS*

Type of Material	Approximate Range of Hydraulic Conductivity
Clay, compact till, shale; unfractured metamorphic and igneous rocks	$< 10^{-7}$ cm/sec
Silt, loess, silty clays, silty loams, clay loams; less permeable limestone, dolomites, and sandstone; moderately permeable till	10^{-5} - 10^{-7} cm/sec
Fine sand and silty sand; sandy loams; loamy sand; moderately permeable limestone, dolomites, and sandstone (no karst); moderately fractured igneous and metamorphic rocks, some coarse till	10^{-3} - 10^{-5} cm/sec
Gravel, sand; highly fractured igneous and metamorphic rocks; permeable basalt and lavas; karst limestone and dolomite	$> 10^{-3}$ cm/sec

*** Derived from:**

Davis, S.N., Porosity and Permeability of Natural Materials in Flow-Through Porous Media, R.J.M. DeWest ed., Academic Press, New York, 1969

Freeze, R.A. and J.A. Cherry, Groundwater, Prentice-Hall, Inc., New York, 1979