SDMS Document
115567

FINAL REMEDIAL INVESTIGATION REPORT

Virgin Island Chemical Site
St. Croix, U.S. Virgin Islands

VOLUME II
APPENDICES A-G, I-K

Prepared By:

McLaren/Hart, Inc.
25 Independence Boulevard
Warren, NJ 07059

Prepared For:

Berlex Laboratories, Inc.
15049 San Pablo Avenue
P.O. Box 4099
Richmond, CA 94804

and

Pharmacia & Upjohn
7171 Portage Road
Kalamazoo, MI 49001

February 2000



SCIENCE : STRATEGY : TECHNOLOGY : SOLUTIONS

303677

Golder Associates Inc.

1951 Old Cuthbert Road, Suite 301
Cherry Hill, NJ 08034
Telephone (856) 616-8166
Fax (856) 616-1874

Golder Associates

November 17, 2000

Project No.: 003-6016

Ms. Caroline Kwan
Remedial Project Manager
U.S. Environmental Protection Agency, Region II
Emergency & Remedial Response Division
Sediments and Caribbean Team
290 Broadway, 20th Floor
New York, New York 10007-1866

RE: REVISED FINAL RISK ASSESSMENT – REVISED PAGES
VIRGIN ISLAND CHEMICAL SITE, ST. CROIX, U.S. VIRGIN ISLANDS

Dear Ms. Kwan:

On behalf of Berlex Laboratories, Inc. and Pharmacia, Golder Associates Inc. (Golder) is enclosing four (4) copies of the revised and missing pages from the Revised Final Risk Assessment for the Virgin Island Chemical Site located in St. Croix, U.S. Virgin Islands. The Revised Final Risk Assessment was submitted to USEPA on October 24, 2000. The enclosed pages have been revised or provided, as appropriate, to address the comments received from USEPA on November 8, 2000. The pages are provided in 3-ring binder format for direct insertion into the Revised Final Risk Assessment, which should be located in Volume II, Appendix J of the Revised Final Remedial Investigation Report.

The enclosed pages include the following:

1. Pages 6-2 and 6-3, and Tables 7.2, 7.3 and 7.6, which were inadvertently missing from the Revised Final Risk Assessment submitted by Golder to USEPA on October 24, 2000. We apologize for this oversight.
2. Pages ES-3 through ES-9, 3-11, and 5-15; and Tables 7-20a and b, 7.22a and b, 8.20a and b, 8.22a and b, and 10.5b, which were corrected in response to USEPA's November 8, 2000 comments. These corrections do not affect the final risk calculations.

Please note that the shower model information was provided as Attachment B in the Revised Final Risk Assessment submitted on October 24, 2000.

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We trust that these revised pages will adequately address USEPA's comments. If you have any questions, please do not hesitate to contact me.

Very truly yours,

GOLDER ASSOCIATES INC.

Susan A. Sciarratta, P.E.
Project Manager

cc: Terry Grimmer, Berlex Laboratories
William Gierke, Pharmacia & Upjohn
Syed Syedali, VIDPNR

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APPENDIX A

ZONING INFORMATION

GOVERNMENT OF
THE VIRGIN ISLANDS OF THE UNITED STATES

—o—

OFFICE OF THE TAX ASSESSOR

Christiansted, St. Croix, V. I. 00820

OFFICE OF
THE LIEUTENANT GOVERNOR

1131 KINGS STREET
SUITE 101
CHRISTIANSTED, ST. CROIX
U.S. VIRGIN ISLANDS 00820
(809) 773-6449

March 16, 1999

Mr. Anuj Gulati
25 Independence Boulevard
Warren, New Jersey, 07059

Dear Mr. Gulati:

Enclosed please find two (2) copies of the section of the zoning map of Plot No. 13-Q of Estate Bethlehem that was requested by you in your letter.

If we can be of further assistance, please don't hesitate to call on us.

Sincerely,

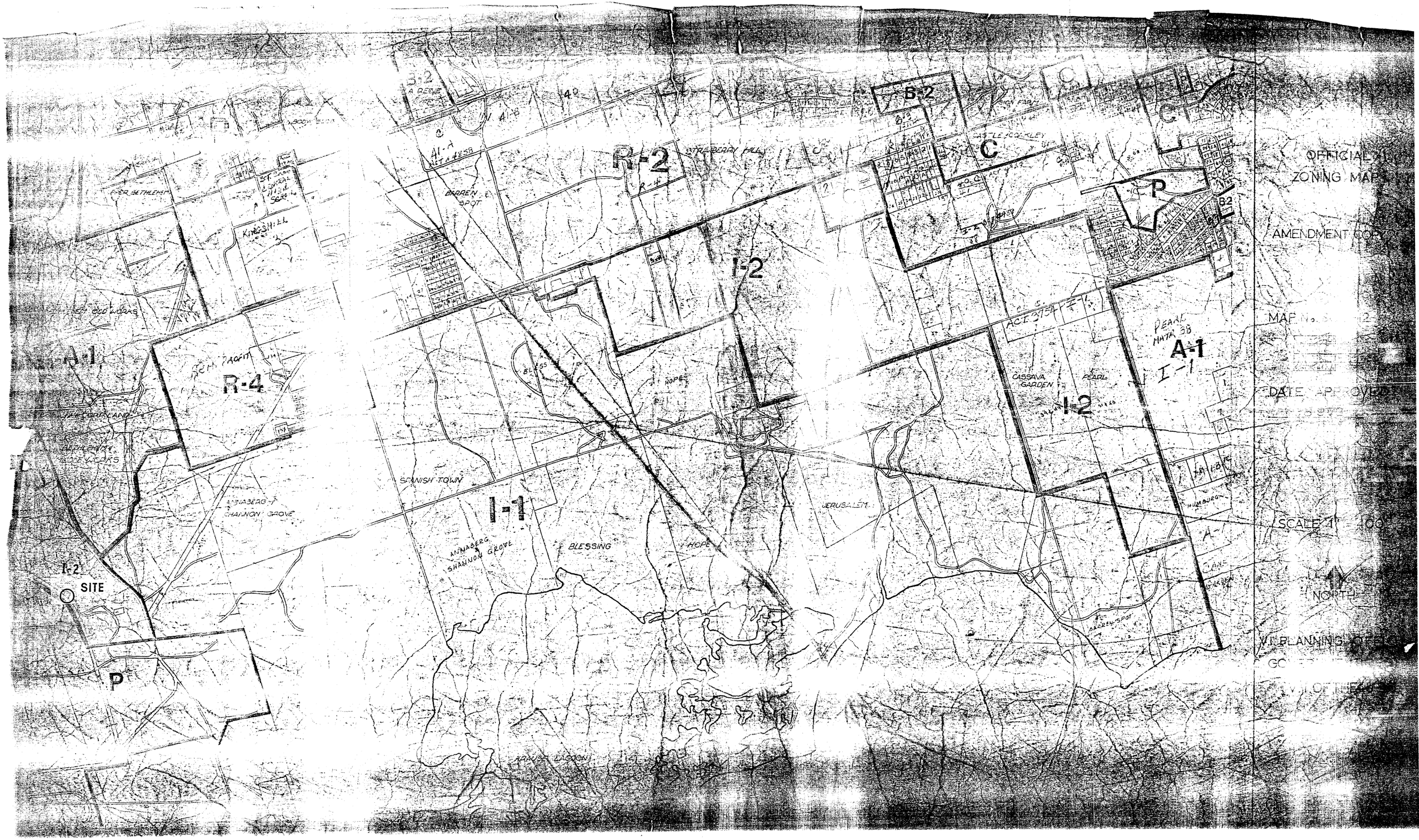
Laurely K. Lynch

Laurely K. Lynch

Encl: - 2

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R-2
STRAWBERRY HILL
I-2
B-2
C
R
A-1
I-1
R-4
P
I-2
SITE
SCALE 1"
NORTH
AMENDMENT COPY
MAP No.
DATE APPROVED
ZONING MAP
SPANISH TOWN
ANNABERG
SHANNON GROVE
BLESSING
HOPE
JERUSALEM
CASSAVA GARDEN
PEARL
BARREN SPOT
ARNUSS LAGOON
KINGS HILL
NEW CORNWALL
ACT 3 MAP 11
ACT 3 MAP 11 A
ACT 3 MAP 11 B
ACT 3 MAP 11 C
ACT 3 MAP 11 D
ACT 3 MAP 11 E
ACT 3 MAP 11 F
ACT 3 MAP 11 G
ACT 3 MAP 11 H
ACT 3 MAP 11 I
ACT 3 MAP 11 J
ACT 3 MAP 11 K
ACT 3 MAP 11 L
ACT 3 MAP 11 M
ACT 3 MAP 11 N
ACT 3 MAP 11 O
ACT 3 MAP 11 P
ACT 3 MAP 11 Q
ACT 3 MAP 11 R
ACT 3 MAP 11 S
ACT 3 MAP 11 T
ACT 3 MAP 11 U
ACT 3 MAP 11 V
ACT 3 MAP 11 W
ACT 3 MAP 11 X
ACT 3 MAP 11 Y
ACT 3 MAP 11 Z

B

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APPENDIX B

WATER USE SURVEY RESULTS

APPENDIX B

WATER USE SURVEY RESULTS

A water use survey was conducted within a ½-mile radius of the Site by McLaren/Hart in October 1998. The purpose of this survey was to collect information on construction details, pumping rates, and general water use for wells located in the vicinity of the VICHEM Site that could potentially be affected by Site impacts or that could potentially influence groundwater flow across the Site via pumping. Data was collected through interviews with well owners, review of historical information, and discussions with personnel from WAPA and VIDPNR. Information was collected for the following wells (see Figure B-1):

- Charlie's Concrete #1 and #2 (2 wells),
- VIPA #1 and #2 (2 wells),
- Cariño's Water Service (1 well),
- Fairplains Well Field (9 wells),
- Negro Bay Well Field (10 wells),
- Meridian Engineering # 1 and #2 (2 wells),
- USGS wells located near the intersection of East Airport Road and M.E. Highway (2 wells),
- Carr's (1 well), and
- Zenon Construction #1 (1 well).

Each well (excluding the Fairplains and Negro Bay Well Fields) were surveyed during the Phase III Investigation in June 1997. Table B-1 presents the construction details for each well.

The water use in this portion of St. Croix is primarily for light industrial operations. As noted previously, the Site is in the vicinity of several industries including concrete operations, paving operations, and a construction company. In addition, two VIPA production wells are located approximately 1,000 feet to the northwest of the Site. During the Phase IV investigation (October 1998), McLaren/Hart personnel interviewed the owners/operators of each well.

Charlie's Concrete #1 and #2

All information concerning the site operations and production wells was obtained from the site maintenance supervisor, Mr. Tongue.

Two wells, identified as wells #1 and #2 are located at Charlie's Concrete Company (Plot 13-I). Charlie's Concrete is one of two companies on St. Croix that mixes, delivers, and pours concrete. This facility has been in operation for over ten years. However, beginning in July 1998, plant operations at this facility ceased. Most of the operations were transferred to a second facility on West Airport Road near the Cruzan Rum facility. The headquarters of Charlie's Concrete and their offices are still located at this facility.

Two wells, identified as wells #1 and #2 are located at Charlie's Concrete Company (Plot 13-I). Charlie's Concrete is one of two companies on St. Croix that mixes, delivers, and pours concrete.

This facility has been in operation for over ten years. However, beginning in July 1998, plant operations at this facility ceased. Most of the operations were transferred to a second facility on West Airport Road near the Cruzan Rum facility. The headquarters of Charlie's Concrete and their offices are still located at this facility.

Charlie's Concrete #1 is located directly across the River Gut near monitoring well MW-3. Historically, this well was used for plant operations (e.g., wetting/mixing concrete, washing machinery). During the period of full-plant operation, it was turned on at the beginning of the day at approximately 6 a.m. and shut off at the end of the day at approximately 6 p.m. The average pumping rate during production was approximately 15-20 gpm. The well is no longer used for any purpose.

Charlie's Concrete #2 is located near the Truck Maintenance Area and is in the vicinity of monitoring well MW-5. Prior to the installation of Charlie's Concrete #1 (in 1996), #2 was used for production purposes. During operations, this well produced a maximum yield of approximately 8-10 gpm. This well is now used only for household use (e.g. sinks, toilets). The water is either well is not used for drinking purposes

Virgin Islands Port Authority (VIPA) #1 and #2

Two VIPA wells are located approximately 1,000 feet to the west of the Site. These wells were historically used to supply all of the water for use at the Henry Rohlsen Airport. The water is first pumped from the two wells to a holding tank on top of the adjacent hill (referred to as the Aeronautical Beacon), and then sent down the other side of the hill towards the Airport. The water is then stored in a 500,000-gallon holding tank, which is located near the rock quarry to the east of the airport. The water is chlorinated in this tank. The pumps in the wells are turned on manually when the amount of water in this 500,000 gallon tank is low. VIPA is in the process of shifting to a system in the near future, which will automatically determine if the tank is low, and then turn on the pumps accordingly. After the water is chlorinated, the water is sent through the distribution line and used at the airport. Until mid-1998, the water was used for all airport needs, including drinking water. Currently, the water is not used for potable purposes, but rather for outdoor cleaning and construction.

Because the water is not used for household purposes, the demand for water from these wells has decreased dramatically. During the Phase III Investigation (June 1997 through April 1998), the wells were observed to be pumping almost continuously at a rate of approximately 15 to 20 gpm. However, during the Phase IV investigation, these wells were not pumping during the entire October 1998 mobilization (a three-week time span).

During the Phase IV investigation (October 1998), McLaren/Hart sampled these wells. The results are discussed in Section 4.0 of the RI Report.

Meridian Engineering (VIAPCO) #1 and #2

Two Meridian Engineering wells (also referred to as VIAPCO) are located on Plot 13-H. In the past, Meridian Engineering used Well #2 for their asphalt scrubber. These operations used

possibly over 10,000 gpd. However, the scrubber is no longer used because of potential air emissions violations. This well is now used to fill tanker trucks for water distribution to various construction sites around the island. Approximately 900 gallons are pumped from this well per day. Water from Well #1 is used very infrequently. Approximately 600 gallons per day may be used to wet the roads at the facility to suppress dust disturbed by the trucking operations.

Cariño's Water Service

One well is located on the property of Cariño's Water Service (Plots 13-V, W, and X). This well was installed in 1997, and is used for truck cleaning and household use. The typical pumping rate is approximately 10 to 20 gpm and, depending on water demand on St. Croix, up to 5,000 gpd is discharged from this well.

Fairplains and Negro Bay Well Fields

Several production well fields exist on the island to provide drinking water to the residents. However, this water is generally brackish and must go through a reverse osmosis operation before consumption. The Fairplains and Negro Bay Well Fields are located in the vicinity of the Site (Figure B-2).

The Fairplains Well Field consists of nine wells and is located downgradient of the Site. The locations of Fairplains #1 and #4 are unknown. Four of the wells (Fairplains #2, #3, #5, and #6) are located near the 100,000 gallon tank adjacent to the pumping station (behind Zenon Construction). These wells are out of service and will not be used in the future.

Three of the wells (Fairplains #7, #8, and #9) are located along Melvin Evans Highway. WAPA personnel indicated that Fairplains #7 (formerly referred to as Zenon #2 in McLaren/Hart correspondence) was destroyed by Zenon Construction. The well is covered by debris and other material and no longer exists. Fairplains #8 is located within a locked pump house on Zenon's property and is inaccessible. Fairplains #9 (formerly referred to as WAPA in McLaren/Hart correspondence) is located approximately 2,000 feet downgradient of the Site. These wells are out of service and will not be used in the future.

The Negro Bay Well Field consists of five production wells (#3, #4, #5, #6, and #7) and is much newer than the Fairplains wells. At this point, all of the Negro Bay wells are inactive, but will be in use upon completion of the reverse osmosis system at the Fairplains pumping station.

Zenon Construction

One well, identified as Zenon #1, exists at Zenon Construction Company (Plot 13-O). Zenon #2, later identified as Fairplains #7, was destroyed. Zenon #1 is located in the Truck Maintenance Area and is only used for cleaning of equipment and trucks. Typically, no more than 100 gallons of water per day is extracted from this well.

Carr's Well

One well, identified as the Carr's Well, exists at Carr's Airport Service Center (Plot 13-G). the Carr's well is located at the rear of the property and is only used for cleaning of equipment, trucks, and animals. The water is not used for drinking or cooking. Typically, no more than 50 gallons of water per day is extracted from this well.

USGS Wells

Several USGS monitoring wells are located at the intersection of East Airport Road and Melvin Evans Highway adjacent to the Guts. These are monitoring wells only. No water is pumped from these wells.

Table B-1
Well Construction Details
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

		Well Construction Information						Survey Elevations							
Well ID	Well Information Source	Construction Date	Name of Driller	Total Depth (ft bgs)	Well Materials	Well Diameter (in.)	Screened Interval (ft bgs)	Ground (ft msl)	TOC (ft msl)	TIC (ft msl)	Typical Pumping Rate	Typical Duration	Manual/ Auto Shut-off	Water Usage	Notes
VIPA #1	Jeff Lawlor, VIPA	NA	NA	Approx 120'	Steel Casing	6	Open Hole	34.82	36.36	NA	15-20 gpm	Periodic	Manual	Industrial	VIPA #1 and #2 were formerly used to supply all water to Henry Rohlsen Airport. VIPA has switched all Airport service to WAPA-supplied water
VIPA #2	Jeff Lawlor, VIPA	NA	NA	Approx 120'	Steel Casing	6	Open Hole	35.06	36.53	NA	15-20 gpm	Periodic	Manual	Industrial	
USGS	NA	NA	NA	51.44 *	PVC Screen and Riser	4	NA	17.57	20.71	NA	NA	NA	NA	NA	Monitoring well only.
Charlie's #1	Mr. Tongue, Site Maintenance Supervisor	1996	Berg	59.19 *	Steel Casing	6	Open Hole	28.14	28.62	NA	20 pgm	Periodic	Manual	Operations	Known as Well #2 to Site workers. Formerly operated from approximately 6 am to 6 pm during the week.
Charlie's #2	Mr. Tongue, Site Maintenance Supervisor	1989	Berg	53.83 *	Steel Casing	6	Open Hole	27.13	27.20	NA	7.5 gpm	Periodic	Manual	Household	Known as Well #1 to Site workers. Formerly operations well prior to installation of other on-site well.
Carr's	Mr. Carr, Well Owner	NA	NA	34.19 *	Steel Casing	6	Open Hole	28.49	29.08	NA	50 gpd	Periodic	Manual	Washing	
Carino's	Mr. Anastacio Carino, Well Owner	1997	Berg	Approx 70'	Steel Casing	6	Open Hole	NA	NA	NA	15-20 gpm	Periodic	Manual	Water Service	Water usage depends on demand for construction/industrial use around St. Croix.
Meridian #1 (VIAPCO #1)	Mr. William Golden, Site Supervisor	NA	NA	NA	Steel Casing	6	NA	33.49	33.57	NA	600 gpd	Periodic	Manual	Industrial	Well is inaccessible. Attached to scale-house.
Meridian #2 (VIAPCO #2)	Mr. William Golden, Site Supervisor	NA	NA	80.13 *	Steel Casing	6	NA	35.02	36.63	NA	900 gpd	Periodic	Manual	Industrial	Well was formerly used to run asphalt scrubber.
Zenon #1	Mr. Carlos Zenon, Well Owner	NA	NA	55 *	Steel Casing	6	Open Hole	27.50	28.54	NA	100 gpd	Periodic	Manual	Industrial	
Fairplains #2	Mr. Hector Mercado, WAPA	NA	NA	NA	Concrete	8	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Abandoned" by WAPA
Fairplains #3	Mr. Hector Mercado, WAPA	NA	NA	NA	Concrete	8	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Abandoned" by WAPA
Fairplains #5	Mr. Hector Mercado, WAPA	NA	NA	NA	Concrete	8	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Abandoned" by WAPA
Fairplains #6	Mr. Hector Mercado, WAPA	NA	NA	NA	Concrete	8	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Abandoned" by WAPA
Fairplains #7 (Zenon #2)	Mr. Hector Mercado, WAPA	NA	NA	12.62 *	Concrete	8	NA	24.34	24.98	NA	NA	NA	NA	NA	Well was destroyed (covered by fill)
Fairplains #8	Mr. Hector Mercado, WAPA	NA	NA	NA	Concrete	6	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Abandoned" by WAPA
Fairplains #9 (WAPA)	Mr. Hector Mercado, WAPA	NA	NA	64.12 *	Concrete	8	NA	27.58	29.27	NA	NA	NA	NA	NA	Characterized as "Abandoned" by WAPA
Negro Bay #1	Mr. Hector Mercado, WAPA	NA	NA	103	Concrete	6	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Inactive" by WAPA
Negro Bay #4	Mr. Hector Mercado, WAPA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Inactive" by WAPA
Negro Bay #5	Mr. Hector Mercado, WAPA	NA	NA	130	Concrete	8	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Inactive" by WAPA
Negro Bay #6	Mr. Hector Mercado, WAPA	NA	NA	115	Concrete	8	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Inactive" by WAPA
Negro Bay #7	Mr. Hector Mercado, WAPA	NA	NA	130	Concrete	8	NA	NA	NA	NA	NA	NA	NA	NA	Characterized as "Inactive" by WAPA

- measured from top of outer casing
bgs - feet below ground surface
msl - feet mean sea level
)C - top of outer casing
C - top of inner casing
A - not available
m - gallons per minute
d - gallons per day

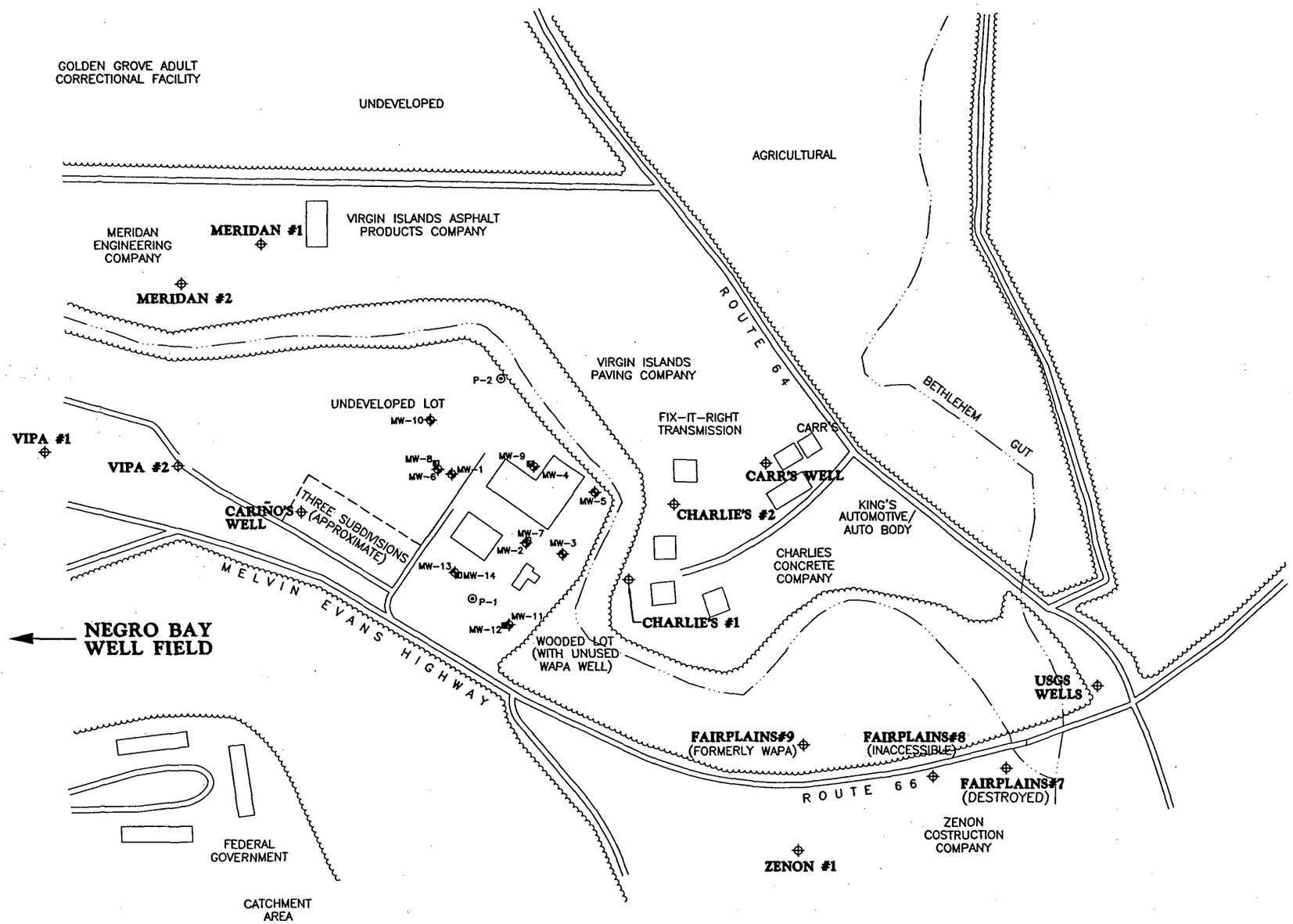
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VIRGIN ISLAND WATER & POWER AUTHORITY WATER DISTRIBUTION
WELL FIELD INFORMATION

WELL #	LOCATION	S.W.L	DEPTH	EST. G.P.D.	CASING	CONST DATE	DRILLER	OWNER	COMMENTS
#3	NEGRO BAY	62	103	10,000	6" PVC	1994	CHT	WAPA	INACTIVE
#7	NEGRO BAY	67	130	16,000	8" CI	N/A	N/A	WAPA	"
#6	NEGRO BAY	59	115	14,000	8" CI	N/A	N/A	WAPA	"
#5	NEGRO BAY	53	130	16,000	8" CI	N/A	N/A	WAPA	"
#4	NEGRO BAY	70	164	14,000	6" PVC	1994	CHT	WAPA	INACTIVE
		ABANDON (6-1999)							
#1	FAIRPLAIN	88	103	13,000	8 CI	N/A	N/A	WAPA	INACTIVE
#2	FAIRPLAIN	N/A	N/A	N/A	"	"	"	"	ABANDON
#3	FAIRPLAIN	"	"	"	"	"	"	"	"
#4	FAIRPLAIN	N/A	N/A	"	"	"	"	"	"
#5	FAIRPLAIN	"	"	"	"	"	"	"	"
#6	FAIRPLAIN	N/A	"	"	"	"	"	"	"
#7	FAIRPLAIN	25	80	14,000	"	N/A	"	"	"
#8	FAIRPLAIN	26	73	14,000	6" CI	N/A	N/A	WAPA	ABANDON
#9	FAIRPLAIN	27	65	14,000	8" CI	N/A	N/A	WAPA	ABANDON
#9	BETHLEHEM	21	120	56,000	6" PVC	1994	CHT	WAPA	INACTIVE
#10	BETHLEHEM	28	120	52,000	6" PVC	1994	CHT	WAPA	INACTIVE
#5	BARREN SPOT	55	103	64,000	8 CI	N/A	N/A	N. CORREA	INACTIVE
School	BARREN SPOT	62	N/A	N/A	8 CI	"	"	?	ABANDON
#3A	BARREN SPOT	62	87	20,000	8 CI	"	"	N. CORREA	INACTIVE
#6	BARREN SPOT	75	105	14,000	8 CI	N/A	N/A	"	"
#7	BARREN SPOT	54	124	28,000	8 CI	"	N/A	"	"
#23	BARREN SPOT	68	129	21,000	6 PVC	"	CHT/USGS	N. CORREA	"
#24	BARREN SPOT	56	120	22,000	6 PVC	N/A	CHT/USGS	"	INACTIVE
#25	BARREN SPOT	70	110	21,000	6 PVC	"	CHT/USGS	"	"
#31	BARREN SPOT	55	122	20,000	8 CF	N/A	N/A	"	"

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(provided by WAPA during 10/98 field investigation)



LEGEND

- BUILDING
- STREAM
- ROAD
- TREE LINE
- APPROX. LOCATION OF OFFSITE WELLS
- ONSITE MONITORING WELLS
- ONSITE PRODUCTION WELLS
- DEEP MONITORING WELL LOCATION

SCALE

150 75 0 150 FEET

FIGURE B-1

REV#	DATE	DESCRIPTION	APP'D

ISLAND CHEMICAL SITE
ST. CROIX, U.S. VIRGIN ISLANDS

McLAREN/HART, INC.
WARREN, NEW JERSEY

DRWN: J.R.F.	CHK'D: A.G.	APP'D: P.K.
SCALE: AS SHOWN		DATE: 01/15/99

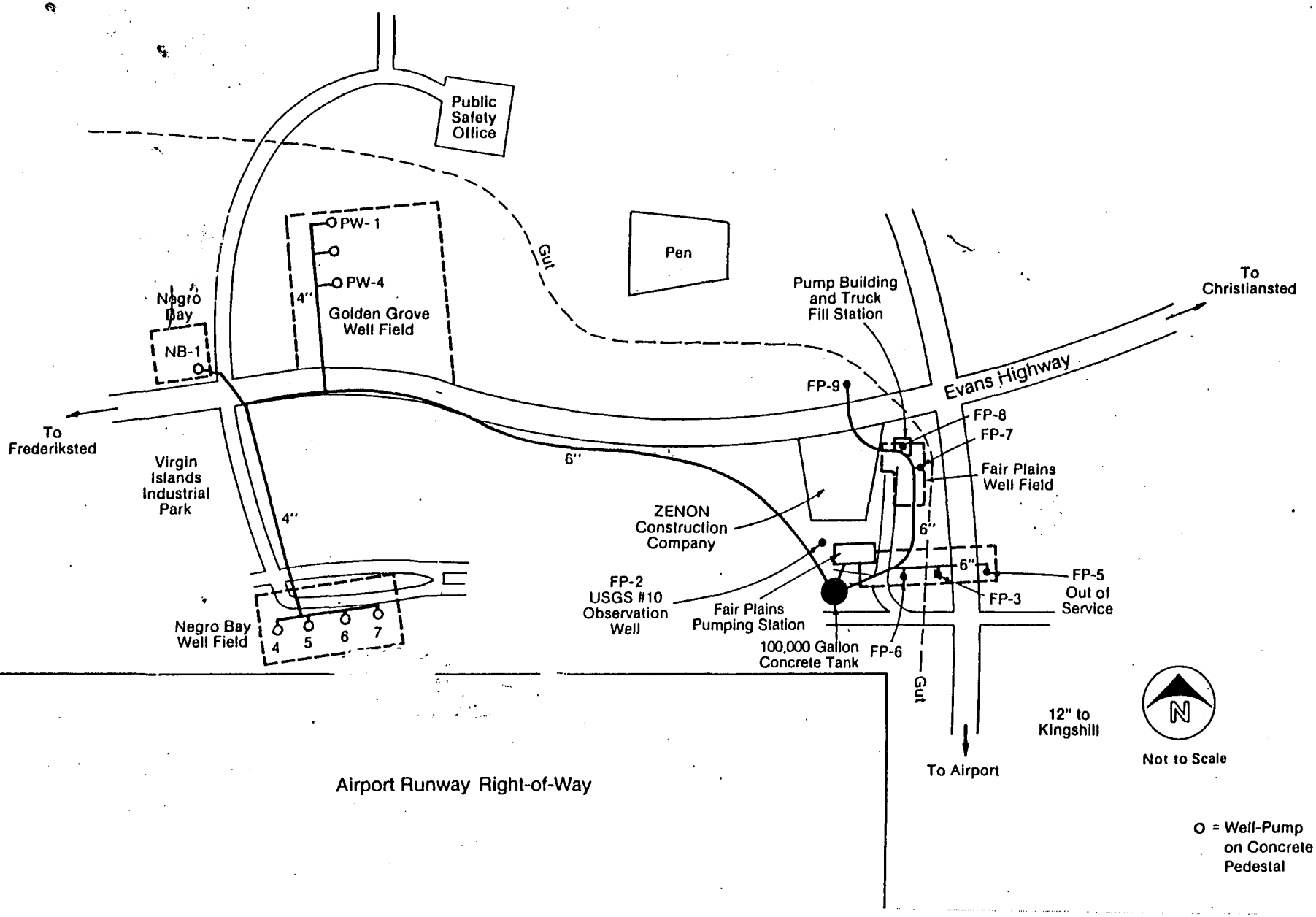
OFFSITE PRODUCTION WELL LOCATION MAP

SOURCE: HARDING LAWSON ASSOCIATES

DWG: 8710018 01/15/99

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GN15278.AO



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Status 1985

FIGURE B-2

Fair Plains Well Field.

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APPENDIX C

RAINFALL SUMMARY

Table C-1
Rainfall Summary
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

February 1995		
Date	Precipitation Water Equivalent	Significant Field Events
1	0.00	
2	0.00	
3	0.00	
4	0.02	
5	0.00	
6	0.00	
7	0.00	
8	0.00	
9	0.00	
10	0.00	
11	0.05	
12	0.07	
13	0.00	
14	0.00	
15	0.03	Sampling Event Begins
16	0.48	Sampling Event Completed
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		

April 1995		
Date	Precipitation Water Equivalent	Significant Field Events
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25	0.00	
26	0.00	
27	0.00	
28	0.00	
29	NA	
30	0.00	

May 1995		
Date	Precipitation Water Equivalent	Significant Field Events
1	0.00	
2	0.00	
3	0.00	
4	0.00	
5	0.02	
6	0.65	
7	0.29	
8	0.10	
9	0.00	Sampling Event Begins
10	1.84	Sampling Event Completed
11	0.04	
12	0.00	
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

*Information from National Climatic Data Center (NCDC), Asheville, NC

303697

Table C-1
Rainfall Summary
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

May 1996		
Date	Precipitation Water Equivalent	*Significant Field Events*
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15	0.00	
16	0.18	
17	0.02	
18	0.00	
19	0.08	
20	0.00	
21	0.00	
22	NA	
23	0.00	
24	0.00	
25	0.00	
26	NA	
27	0.00	
28	0.00	
29	NA	
30	0.00	Sampling Event Begins
31	0.00	Sampling Event Completed

SEPTEMBER 1997		
Date	Precipitation Water Equivalent	*Significant Field Events*
1	0.16	
2	0.11	
3	0.23	
4	0.00	
5	0.00	
6	0.00	
7	0.20	
8	0.01	McLaren/Hart Onsite
9	0.00	
10	0.00	
11	0.00	
12	0.00	Onsite/Offsite Water Levels
13	0.09	
14	0.05	
15	0.28	
16	1.80	
17	0.00	
18	0.10	
19	0.00	Onsite/Offsite Water Levels
20	0.00	
21	0.08	
22	0.30	
23	0.03	
24	0.24	
25	0.10	Onsite/Offsite Water Levels
26	0.06	
27	0.05	
28	0.06	
29	0.21	
30	0.00	

OCTOBER 1997		
Date	Precipitation Water Equivalent	*Significant Field Events*
1	0.00	Onsite/Offsite Water Levels
2	0.70	
3	0.47	
4	0.04	
5	0.11	
6	0.00	
7	0.00	
8	0.00	
9	0.03	McLaren/Hart Offsite
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

*Information from National Climatic Data Center (NCDC), Asheville, NC

303698

Table C-1
Rainfall Summary
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

DECEMBER 1997		
Date	Precipitation Water Equivalent	Significant Field Events
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15	0.04	
16	0.00	
17	0.06	
18	0.00	
19	0.00	
20	0.00	
21	1.05	
22	0.08	
23	0.01	
24	0.00	
25	0.00	
26	0.00	
27	0.00	
28	0.00	
29	0.00	
30	0.00	
31	0.00	

JANAURY 1998		
Date	Precipitation Water Equivalent	Significant Field Events
1	0.12	
2	0.06	
3	0.06	
4	0.16	
5	0.08	
6	0.13	
7	0.18	McLaren/Hart Onsite
8	0.76	Sampling Event Begins
9	0.10	
10	0.20	
11	0.00	
12	0.00	
13	0.01	
14	0.00	Sampling Event Completed
15	0.00	
16	0.00	Telogs in Wells
17	0.17	McLaren/Hart Offsite
18	0.01	
19	0.00	
20	0.00	
21	0.00	
22	0.00	
23	0.00	
24	0.08	
25	0.13	
26	0.01	
27	0.06	
28	0.00	
29	0.00	
30	0.00	
31	0.00	

FEBRUARY 1998		
Date	Precipitation Water Equivalent	Significant Field Events
1	0.01	
2	0.00	
3	0.00	
4	0.00	
5	0.00	
6	0.05	
7	0.00	
8	0.01	
9	0.17	
10	0.01	
11	0.00	
12	0.06	
13	0.00	
14	Measurement Illegible	
15	0.08	
16	0.01	
17	0.02	
18	0.00	
19	0.00	
20	0.02	
21	0.05	
22	0.04	
23	0.00	
24	0.00	
25	0.00	
26	0.04	
27	0.02	
28	0.02	

*Information from National Climatic Data Center (NCDC), Asheville, NC

303699

Table C-1
Rainfall Summary
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

MARCH 1998		
Date	Precipitation Water Equivalent	Significant Field Events
1	0.03	
2	0.00	
3	0.02	
4	0.00	
5	0.00	
6	0.00	
7	0.02	
8	0.00	
9	0.01	
10	0.01	
11	0.00	
12	0.10	
13	0.01	
14	0.03	
15	0.09	
16	0.01	
17	0.12	
18	0.00	
19	0.10	
20	0.04	
21	0.01	
22	0.06	McLaren/Hart Onsite
23	0.00	Telogs Removed/Sampling Begins
24	0.02	
25	0.02	
26	0.20	
27	0.28	
28	0.02	
29	1.04	Sampling Event Completed
30		
31		

SEPTEMBER 1998		
Date	Precipitation Water Equivalent	Significant Field Events
1	0.00	
2	0.29	
3	0.25	
4	0.02	
5	0.06	
6	0.00	
7	0.01	
8	0.49	
9	0.29	
10	0.01	
11	0.00	
12	0.00	
13	0.01	
14	0.05	
15	0.21	
16	0.01	
17	0.00	
18	0.05	
19	0.12	
20	0.29	
21	Rain gauge not read	
22	3.65	
23	0.02	
24	0.02	
25	0.00	
26	0.00	
27	0.00	
28	0.11	
29	0.00	
30	0.00	

*Information from National Climatic Data Center (NCDC), Asheville, NC

303700

Table C-1
Rainfall Summary
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

OCTOBER 1998		
Date	Precipitation Water Equivalent	Significant Field Events
1	0.00	
2	0.04	
3	0.06	
4	0.35	
5	0.00	McLaren/Hart Onsite & Onsite/Offsite Water Levels
6	0.02	Telogs in P-2, MW-8, and MW-9
7	0.01	
8	0.00	Telog in MW-7
9	0.00	
10	0.00	
11	0.01	
12	0.00	
13	0.06	
14	0.02	Telog in P-1
15	0.00	
16	0.08	
17	0.06	
18	0.33	Telog out of P-1
19	0.22	Telogs out of P-2, MW-8, and MW-9
20	0.25	Telog out of MW-7
21	0.05	McLaren/Hart Offsite & Telogs in MW-12 and MW-14
22	2.01	
23	4.24	
24	0.10	
25	0.01	
26	0.00	
27	0.16	
28	0.04	
29	0.82	
30	0.06	
31	0.05	

NOVEMBER 1998		
Date	Precipitation Water Equivalent	Significant Field Events
1	0.61	
2	0.00	
3	0.01	
4	0.03	
5	0.17	
6	0.06	
7	0.08	
8	0.01	
9	0.00	
10	0.09	
11	0.22	
12	0.11	
13	0.06	
14	0.33	
15	0.03	
16		
17		
18		
19		
20		
21		
22		
23		
24		Telogs out of MW-12 and MW-14
25		
26		
27		
28		
29		
30		

*Information from National Climatic Data Center (NCDC), Asheville, NC

303701

D

303702

APPENDIX D

HISTORIC SAMPLING SUMMARY

Table D-1
Areas of Potential Environmental Concern
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Area	Identification	Location	EPA Identification	Description
A	Laboratory and Warehouse Building	Center of site	1	Location of drum storage during EPA removal action.
B	Aboveground Tank Farm	Northwest side of Site	2	Former location of 20 ASTs. Ten tanks remain onsite. ESI identified and excavated area of soil between ASTs 8 and 9 which had been affected by historical releases.
C	Former Process Pit	East of Maintenance Building	3	Former location of underground concrete storage tank used to collect process waste water. Tank was reportedly emptied, cleaned, and filled with concrete by ESI in 1986. Conflicting information is available regarding the size of the tank (8,000 or 17,000 gallons).
D	Loading Dock and Former Laboratory Pit and Drain Area	North of Laboratory	4	Cobble-filled pit located beneath loading dock formerly received waste liquids from laboratory drains. Pit was connected to a second pit located near the property boundary by a 4-inch PVC pipe.
E	Soil Beneath Concrete Pad Near ASTs	Northwest of ASTs	5	ESI identified and excavated one area of soil affected by historical releases.
F	Concrete Storage Pad	North of Laboratory	6	Used for storage of various materials.

AST – aboveground storage tank
ESI – Enviro-Sciences, Inc.
PVC – polyvinyl chloride

303704

Table D-2
Summary Of Environmental Sampling
Area B – Aboveground Tank Farm
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
T8-1	ca. 09/17/84	Soil	ESI/Berlex	-	Toulene; pyridine; QG; QS	Toluene (694); QG (274); QS (101)
T8-2	ca. 09/17/84	Soil	ESI/Berlex	-	Toluene; pyridine; QG; QS	QG (47)
Tank-8	ca. 09/17/84	Soil	ESI/Berlex	-	Toluene; pyridine; QG; QS	Toluene (13,880); QG (4,050); QS (1,521)
Tank-4	ca. 09/17/84	Soil	ESI/Berlex	-	QG; QS	QG (8,227); QS (2,594)
Tank-9	ca. 09/17/84	Soil	ESI/Berlex	-	QG;QS	QS (354)
Tank-7	ca. 09/17/84	Soil	ESI/Berlex	-	QG; QS	None detected
#4 Sample	ca. 09/17/84	Soil	ESI/Berlex	-	QG; QS	None detected
#4 High Conc.	ca. 09/17/84	Soil	ESI/Berlex	-	QG; QS	None detected
S4-1	ca. 10/15/84	Soil	ESI/Berlex	-	Toluene; pyridine	None detected
Tank-4	03/12/86	Liquid	ESI/ICMI	53581	QS; QC; Benzoquinone; fluorenone	Benzoquinone (30%); fluorenone (70%)

Table D-2
Summary Of Environmental Sampling
Area B – Aboveground Tank Farm
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Tank-7	03/12/86	Liquid	ESI/ICMI	53582	Benzophenone; fluroenone	Benzophenone (39.6%); fluorenone (43.8%); unkown alkane (16.6%)
Tank-8	03/12/86	Liquid	ESI/ICMI	53583	VOCs; benzophenone; fluorenone	Benzophenone (85.7%); fluorenone (14.3%); toluene (8)
Tank-9	03/12/86	Liquid	ESI/ICMI	53584	VOCs; p-Phenetidine	Acetone (4.2); ethylbenzene (0.15); p-Phenetiden (89.1%); toluene (0.05); xylenes (14.1); unknown aromatic (10.9%)
Tank-10	03/12/86	Liquid	ESI/ICMI	58535	Hydroxyfurano -coumarin	Hydroxyfuranocoumarin (87.6%)
Tank-11	03/12/86	Liquid	ESI/ICMI	53586	Hydroxyfurano -coumarin	Hydroxyfuranocoumarin (82.4%)
Tank-12	03.12.86	Liquid	ESI/ICMI	53587	Hydroxyfurano -coumarin; p-phenetidine	Hydroxyfuranocoumarin (50.7%); p-phenetidine (46.3%)
Tank-13	03/12/86	Liquid	ESI/ICMI	53588	p-phenetidine	p-phenetidine (100%)
Tank-14	03/12/86	Liquid	ESI/ICMI	53589	VOCs; benzophenone; fluroenone	Chloroform (0.008[B]); methylene chloride (0.011[B]); benzophenone (64.8%); fluorenone (35.2%); toluene (0.0067[B])
VI25-S2	02/28/91	Soil	EPA/Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Heptachlor epoxide (J); Dieldrin (J); y-Chlordane (J); Al (21,700); As (7.65); Co (21.1); Cu (99.8); Fe (44,100); Pb (35.3); Mg (7,800); Mn (1,050); Ni (18.8); K (2,990); Na (J); V (97.2); Zn (387J)

303706

Table D-2
Summary Of Environmental Sampling
Area B – Aboveground Tank Farm
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
VI25-S3	02/28/91	Soil	EPA/Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Alfrin (30J); Heptachlor epoxide (10J); Dieldrin (J); 4-4'-DDE (5.8J); Endrin (J); Endosulfan sulfate (J); 4-4'-DDT (J); Endrin Ketone (J); gamma-Chlordane (7.5J); Al 21,000); SB (J); As (9.1J); Co (22.3); Cu (73.7); Fe (81,700); Pb (322); Mg (7,420); Mn (987); Ni (33.5J); K (2,920); Na (J); V (63.5); Zn (362J)

Notes:
[1] Reported concentrations in parentheses, presented in parts per million (ppm). See Table C-7 for list of chemical abbreviations.
[2] Laboratory reported fluorethyne "possibly from plastic bag"
B Compound detected in blank sample
J Estimated concentration
T Tentatively identified compound
B/N Base/neutral extractable compounds
AECs Acid extractable compounds
PCBs Polychlorinated biphenyls
Pest. Pesticides
VOCs Volatile organic compounds

303707

Table D-3
Summary of Environmental Sampling
Area C – Former Process Pit
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Pit-Duplicate	06/14/85	Liquid	ESI/ICMI	42885	Not analyzed	Insufficient sample volume to analyze
Pit Sludge	06/14/85	Sludge	ESI/ICMI	42886 & 42887 – Composite	VOCs; Pest; PCBs; AECs; B/Ns; metals; CN; phenol	As (40); Cd (22.8); chloroform (220); Cr (592); Cu (327); CN (1.44); Pb (688); Hg (2.73); methylene chloride (125); Ni (134); phenol (9.01); toluene (1,560); Zn (3,594); benzene methanol ^{T} (15,000J); benzyl acetate ^{T} (170,000J); chloromethylbenzene ^{T} (4,400 J); 1-chloro-2-methylbenzene^{T} (40); diphenyl methanone ^{T} (30,000 J); 9H-fluorene-9-one ^{T} (3,000 J); 1,1'(oxybis (methylene) bis benzene ^{T} (4,000 J)
Pit Sludge	06/14/85	"White Lump"	ESI/ICMI	42888	Unknown	No laboratory report provided
St. Croix	07/19/85	Water	ESI/ICMI	44418	VOCs; Pest; PCBs; B/Ns; AECs; metals; CN; phenol	Benzene (0.04); Cd (0.003); Cr (0.027); Cu (0.153); CN (0.053); Pb (0.011); Hg (0.001); Ni (0.08); phenol (0.16); Ag (0.008); Th (0.029); toluene (0.38); Zn (4.85); benzaldehyde^{T} (3.0 J); chloromethyl benzene^{T} (0.3 J); benzene methanol^{T} (24 J); pheny acetate^{T} (26 J); diphenyl methane^{T} (0.4 J); 1-1' (oxybis (methylene) bis benzene^{T} (0.4 J)

303708

Table D-3
Summary of Environmental Sampling
Area C – Former Process Pit
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
VI25-SED5	02/28/91	Soil	NUS/Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	2-Butanone (0.085 J); xylenes (0.086J); 2-methylnaphthalene (0.63 J); acenapthene (J); fluorene (J); phenanthrene (J); DNBP (J); fluoranthene (J); pyrene (J); BBP (J); B2EHP (2.2 J); gamma-BHC (J); aldrin (0.012 J); heptachlor epoxide (0.048 J); endosulfan I (0.004 J); dieldrin (0.0041 J); 4,4'-DDT (J); methoxychlor (J); gamma-chlordane (0.0035 J); y-chlordane (0.0061 J); Al (9,400); Sb (26.6 J); As (8J); Ba (48.6); Ca (51,200); Cr (57.6 J); Co (13.8); Cu (367); Fe (183,000); Pb (466); Mg (4,740); Mn (925); Ni (47.8 J); K (J); Na (J); V (J); Zn (1,500 J)

Notes:
[1] Reported concentrations in parentheses, presented in parts per million (ppm). See Table C-7 for list of chemical abbreviations.
J Estimated concentration
[T] Tentatively identified compound
B/N Base/neutral extractable compound
AEC Acid extractable compound
BTEX Benzene, toluene, ethylbenzene and xylenes
PCB Polychlorinated biphenyls
Pest Pesticides
VOC Volatile organic compound

Table D-4
Summary of ICC Environmental Sampling
Area D – Loading Dock and Laboratory Pit and Drain Area
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
D-1	ca. 09/17/84	Soil	ESI/Berlex	NA	Toluene; pyridine; QG; QS	Pyridine (920); QG (452); QS (82)
D-2	ca. 09/17/84	Soil	ESI/Berlex	NA	Toluene; pyridine; QG; QS	Pyridine (507); QG (96)
D-3	ca.. 09/17/84	Soil	ESI/Berlex	NA	Toluene; pyridine; QG; QS	None detected
D-4	ca.. 09/17/84	Soil	ESI/Berlex	NA	Toluene; pyridine; QG; QS	None detected
D-5	ca.. 09/17/84	Soil	ESI/Berlex	NA	Toluene; pyridine; QG; QS	Pyridine (3,014); QG (170)
Loc. 4-4'B	09/18-19/84	Soil	ESI/ICMI	34625	VOCs	Fluorethyne^{2T} (0.38); 2-methylpropanol^{T} (0.16)
Loc. 13-3'B	09/18-19/84	Soil	ESI/ICMI	34626	VOCs	Fluorethyne^{2T} (0.31); 2-methylpropanol^{T} (0.16)
Loc. 20-1'B	09/18-19/84	Soil	ESI/ICMI	34624	VOCs	Toluene (0.16); fluorethyne2^{T} (0.45); 2-methylpropanol^{T} (0.20); pentane^{T} (0.01)
Loc. 21-4'B	09/18-19/84	Soil	ESI/ICMI	34627	VOCs	Fluorethyne^{2T} (0.06); 2-methyl-1-heptene^{T} (0.21); 2-methylpropanol^{T} (0.47); pyridine^{T} 0.02)
H22 1'A	ca.. 10/15/84	Soil	ESI/Berlex	-	Toluene; pyridine	None detected
H-21 3'B	ca.. 10/15/84	Soil	ESI/Berlex	-	Toluene; pyridine	Pyridine (1.2)

303710

Table D-4
Summary of ICC Environmental Sampling
Area D – Loading Dock and Laboratory Pit and Drain Area
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
20 Septic	10/23-28/84	Soil	ESI/York	-	Toluene; pyridine; VOCs; O&G	Toluene (0.54); benzene (0.0005J); chloroform (0.012); diphenyl methanone (64); 1,1-methylene bis-Benzene (8.4); methylene chloride (0.0015J); O&G (241)
20 A-2'	10/23-28/84	Soil	ESI/York	-	Toluene; pyridine; VOCs; O&G	Toluene (0.69); benzene (0.0009J); chloroform (0.005); ethylbenzene (0.068); methylene chloride (0.0023J); xylenes (0.6); O&G (566)
21 A-2'	10/23-28/84	Soil	ESI/York	-	Toluene; pyridine; VOCs; O&G	Toluene (0.015); benzene (0.0006J); chloroform (0.0038J); ethylbenzene (0.007); methylene chloride (0.0024J); PCE (0.0009J); TCE (0.0008J); O&G (1,500)
21 A-4'	10/23-28/84	Soil	ESI/York	-	Toluene; pyridine; VOCs; O&G	Toluene (0.043); benzene (0.0004J); chloroform (0.0026J); methylene chloride (0.0022J); O&G (27.9)
25-2'	10/23-28/84	Soil	ESI/York	-	Toluene; pyridine; VOCs; O&G	Toluene (0.21); pyridine (13); benzene (0.0004J); chloroform (0.005); methylene chloride (0.0017J); O&G (89.6)
27-2'	10/23-28/84	Soil	ESI/York	-	Toluene; pyridine; VOCs; O&G	Toluene (0.016); pyridine (26); benzene (0.0006J); chloroform (0.019); methylene chloride (0.0022J); O&G (187)
32-2'	10/23-28/84	Soil	ESI/York	-	Toluene; pyridine; VOCs; O&G	Toluene (0.015); pyridine (43); benzene (0.0008J); chloroform (0.0042J); methylene chloride (0.0044J); 1,1,1-TCA (0.0008J); O&G (50.6)

303711

Table D-4
Summary of ICC Environmental Sampling
Area D – Loading Dock and Laboratory Pit and Drain Area
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
35-4'	10/23-28/84	Soil	ESI/York	ESI/York	Toluene; pyridine; VOCs; O&G	Toluene (0.008); benzene (0.0004J); chloroform (0.013); methylene chloride (0.0024J); 1,1,1-TCA (0.011); O&G (39.5)
36-2'	10/23-28/84	Soil	ESI/York	ESI/York	Toluene; pyridine; VOCs; O&G	Toluene (0.007); benzene (0.0002J); chloroform (0.0014J); methylene chloride (0.006J); O&G (965)
Lab Pit	06/14/85	?	ESI/ICMI	42883	Unknown	No report provided
Lab Pit Duplicate	06/14/85	?	ESI/ICMI	42884	Unknown	No report provided
Lab Pit #1	06/14/85	Soil	ESI/York	-	Pyridine	Pyridine (3.9)
Lab Pit #2	06/14/85	Soil	ESI/York	-	Pyridine	None detected
Lab Pit #3	06/14/85	Soil	ESI/York	-	Pyridine	Pyridine (0.51)
Lab Pit #4	06/14/85	Soil	ESI/York	-	Pyridine	Pyridine (0.18)
Lab Pit #1	07/01/85	Soil	ESI/ICMI	43748	Unknown	No report provided
Lab Pit #2	07/01/85	Soil	ESI/ICMI	43749	Unknown	No report provided
Lab Pit #3	07/01/85	Soil	ESI/ICMI	43750	Unknown	No report provided
Lab Pit #4	07/01/85	Soil	ESI/ICMI	43751	Unknown	No report provided
5436-Lab Pit #1	07/01/85	Soil	ESI/York	-	Pyridine	Pyridine (1.1)
5437-Lab Pit #2	07/01/85	Soil	ESI/York	-	Pyridine	Pyridine (3.4)

303712

Table D-4
Summary of ICC Environmental Sampling
Area D – Loading Dock and Laboratory Pit and Drain Area
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
5438-Lab Pit #3	07/01/85	Soil	ESI/York	-	Pyridine	None detected
5439-Lab Pit #4	07/01/85	Soil	ESI/York	-	Pyridine	None detected
Lab Pit Sample 1	07/17/85	Soil	ESI/ICMI	44630	Unknown	No report provided
Lab Pit Sample 2	07/17/85	Soil	ESI/ICMI	44631	Unknown	No report provided
Lab Pit #5967 COC indicates "Dryer"	08/07/85	Soil	ESI/ICMI	45364	VOCs	Acetone (0.23); benzene (0.01); chloroform (0.11); t-1,2-DCE (0.03); ethylbenzene (0.04); toluene (0.05); xylenes (0.0sJ)
Lab Pit #5965	08/07/85	Soil	ESI/ICMI	45362	VOCs	Acetone (0.32); benzene (0.34); 1,1-DSC (0.02); t-1,2-DCE (0.02); ethylbenzene (0.01); toluene (0.08); xylenes (0.06J)
Lab Pit #5966	08/07/85	Soil	ESI/ICMI	45363	VOCs	Acetone (0.27); benzene (1.37); 1,1-DCA (0.02); t-1,2-DCE (0.01)
Lab Pit	08/07/85	Soil	ESI/ICMI	45360 & 45361	Unknown	No report provided
Lab Pit 12:00	08/07/85	Soil	ESI/York	-	Pyridine	Pyridine (2.7)
Lab Pit 12:00	08/07/85	Soil	ESI/York	-	Pyridine	None detected

Table D-4
Summary of ICC Environmental Sampling
Area D – Loading Dock and Laboratory Pit and Drain Area
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Lab Pit 3:00	08/07/85	Leachate	ESI/York	-	VOCs	Toluene (0.022)
Lab Pit 3:00	08/07/85	Leachate	ESI/York	-	VOCs	Toluene (0.021)
Lab Pit 3:00	08/07/85	Leachate	ESI/York	-	VOCs	Toluene (0.36)
5751-Lab Pit #2	08/07/85	Soil	ESI/York	-	Pyridine	None detected
5752-Lab Pit #1	08/07/85	Soil	ESI/York	-	Pyridine	None detected
Lab Waste Drainage Area (North side surface)	09/09/85	Soil	EPA/EPA	087003	"Purgeable and Non-volatile organic Priority Pollutants"	B2EHP (16); toluene (0.42)
Lab Waste Drainage Area (North side surface)	09/09/85	Soil	EPA/EPA	087004	"Purgeable and Non-volatile organic Priority Pollutants"	B2EHP (1.9); DNOP (4.2); toluene (0.44)
Lab Waste Drainage Area (South side surface)	09/09/85	Soil	EPA/EPA	087005	"Purgeable and Non-volatile organic Priority Pollutants"	B2EHP (51); DNOP (0.6J); toluene (0.36)

303714

Table D-4
Summary of ICC Environmental Sampling
Area D – Loading Dock and Laboratory Pit and Drain Area
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Lab Waste Drainage Area (South side subsurface)	09/09/85	Soil	EPA/EPA	087006	"Purgeable and Non-volatile organic Priority Pollutants"	B2EHP (36); DNBP (75); DNOP (2); toluene (0.4)
085252-ESI	03/13/86	Soil	ESI/ICMI	53363	VOCs; AECs; B/Ns; PCBs	Methylene chloride (0.015B)
085254-ESI	03/13/86	Soil	ESI/ICMI	53365	VOCs; AECs; B/Ns; PCBs	Chloroform (0.0092B); methylene chloride (0.0087B)
085255-ESI	03/13/86	Soil	ESI/ICMI	53366	VOCs; AECs; B/Ns; PCBs	Chloroform (0.0054B); methylene chloride (0.015B)
085252 Lab waste pit seep	03/13/86	Soil	EPA/EPA	NA	VOCs; AECs; B/Ns; Pest; PCBs; metals; dioxins	DNOP (9); As (1J); Cr (22); Cu (45); Ni (20J); Sb (10); Zn (63)
085354 Lab waste pit #1	03/13/86	Soil	EPA/EPA	NA	VOCs; AECs; B/Ns; Pest; PCBs; metals; dioxins	DNOP (4.9); As (0.8J); Be (7J); Cr (27); Cu (55); Ni (25); Sb (8.4); Se (0.8J); Zn (80)
085255 Lab waste pit #2	03/13/86	Soil	EPA/EPA	NA	VOCs; AECs; B/Ns; Pest; PCBs; metals; dioxins	DNOP (3.2); As (2J); Be (7J); Cr (26); Cu (58); Ni (27); Se (0.8J); Zn (79)

303715

Table D-4
Summary of ICC Environmental Sampling
Area D – Loading Dock and Laboratory Pit and Drain Area
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
VI25-S1	02/28/91	Soil	NUS/Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Chlordane (4J); y-Chlordane (4.9J); Al (13,600); Ba (108); ca. (69,300); Cr (19.8J); Co (13.4); Cu (58.7); Fe (21,500); Pb (9); Mg (3,630); Mn (735); Ni (10.7J); K (2,170); V (74.7); Zn (142J)
VI25-SED2[3]	02/28/91	Soil	NUS/Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Al (32,400); Sb (J); As (3.2J); Ba (115); ca. (74,900); Cr (16.3J); Co (23.7); Cu (60.5); Fe (35,800); Pb (7.5); Mg (10,900); Mn (1,320); Ni (13.8J); K (1,400); Na (1,840J); V (62.1); Zn (73.5J)
VI25-SED4[3]	02/28/91	Soil	NUS/Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Al (33,600); As (3.6J); Ba (122); ca. (82,100); Cr (16.8J); Co (25.4); Cu (64.8); Fe (38,840); Pb (7.8); Mg (11,800); Mn (1,430); Ni (15.2J); K (1,600); Na (1,750J); V (64.8); Zn (79.9J)

Notes:
1 Reported concentrations in parentheses, presented in parts per million (ppm). See Table C-7 for list of chemical abbreviations.
2 Laboratory reported fluorethyne "possibly from plastic bag"
3 Duplicate samples
B Substance present in blank
J Estimated concentration
T Tentatively identified compound
B/Ns Base/neutral extractable compounds
AECs Acid extractable compounds
PCBs Polychlorinated biphenyls
Pest Pesticides
VOCs Volatile organic compounds

303716

Table D-5
Summary of Environmental Sampling
Area E – Soil Beneath Concrete Pad Near ASTs
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Sample Name	Sample Date	Matrix	Collected by/ Analyzed by	Parameters Analyzed	Substances Detected[1]
S4-1	ca. 09/17/84	Soil	ESI/Berlex	Toluene; pyridine; QG; QS	None detected
S4-2	ca. 09/17/84	Soil	ESI/Berlex	Toluene; pyridine; QG; QS	None detected
S4-3	ca. 09/17/84	Soil	ESI/Berlex	Toluene; pyridine; QG; QS	None detected
S4-4	ca. 09/17/84	Soil	ESI/Berlex	Toluene; pyridine; QG; QS	None detected
S4-Surface	ca. 09/17/84	Soil	ESI/Berlex	Toluene; pyridine; QG; QS	None detected

Notes:

1 Reported concentration in parentheses, presented in parts per million (ppm). See Table C-7 for list of chemical abbreviations.

303717

Table D-6
Summary of ICC Environmental Sampling
Background, River Gut and Drains
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Area	Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Unknown	Drain Line #1	06/07/85	Soil	ESI/ICMI	42882	BTEX	Benzene (0.1); toluene (235); ethylbenzene (0.25); xylenes (0.6)
Unknown	Drain Line #2	06/07/85	Soil	ESI/ICMI	42881	VOCs	Carbon tetrachloride (10); chloroform (68); ethylbenzene (9); methylene chloride (1,240); toluene (5,600); xylenes (18^{T})
Unknown	Drain Line #1	06/07/85	Soil	ESI/York	-	Toluene	Toluene (140)
Unknown	Drain Line #2	06/07/85	Soil	ESI/York	-	Toluene	Toluene (310)
Gut	G-1	02/19/86[3]	Soil	ESI/ICMI	52463	Metals; CN; phenols; VOCs	Cr (14.5); Cu (37.3); Pb (21); Zn (63.1)
Gut	G-1 Dup	02/19/86[3]	Soil	ESI/ICMI	52463	Metals; CN; phenols; VOCs	Cr (17.9); Cu (43.5); Pb (25.7); Zn (67.8)
Gut	G-2	02/19/86[3]	Soil	ESI/ICMI	52464	Metals; CN; phenols; VOCs	Cr (16.4); Cu (38.3); Pb (22); Zn (57.8)
Gut	G-3	02/19/86[3]	Soil	ESI/ICMI	52465	Metals; CN; phenols; VOCs	Cr (16.7); Cu (33.8); Pb (14.5); Zn (129)
Gut	G-4	02/19/86[3]	Soil	ESI/ICMI	52466	Metals; CN; phenols; VOCs	Cr (12); Cu (25.3); Pb (13.2); Zn (37.1)
Gut	G-5	02/19/86[3]	Soil	ESI/ICMI	52467	Metals; CN; phenols; VOCs	Cr. (17.1); Cu (36.1); Pb (20.2); Zn (57.2)
Gut	G-6	02/19/86[3]	Soil	ESI/ICMI	52468	Metals; CN; phenols; VOCs	Cd (1.0); Cr (46.6); Cu (40); Pb (32.9); Zn (349)

303718

Table D-6
Summary of ICC Environmental Sampling
Background, River Gut and Drains
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Area	Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Gut	G-7	02/19/86[3]	Soil	ESI/ICMI	52469	Metals; CN; phenols; VOCs	Cd (2.4); Cr (71.1); Cu (51.4); Pb (46.4); Zn (861)
Gut	G-8	02/19/86[3]	Soil	ESI/ICMI	52470	Metals; CN; phenols; VOCs	Cr (20.4); Cu (32.8); Pb (19.4); Zn (76.2)
Gut	G-9	02/19/86[3]	Soil	ESI/ICMI	52471	Metals; CN; phenols; VOCs	Cr (19.8); Cu (34.9); Pb (21.4); Zn (75.7)
Gut	G-10	02/19/86[3]	Soil	ESI/ICMI	52472	Metals; CN; phenols; VOCs	Cr (30.6); Cu (62.7); Pb (16.5); Zn (66.5)
Gut	G-11	02/19/86[3]	Soil	ESI/ICMI	52473	Metals; CN; phenols; VOCs	Cr (41.1); Cu (69.7); Pb (12.8); Zn (871)
Gut	G-6G-7 Comp.	02/19/86[3]	Leachate	ESI/ICMI	54501	RCRA Metals	Ba (1.2); Pb (0.24)
Gut G-1	085251-ESI	03/13/86	Soil	ESI/ICMI	53362	VOCs; SVOs; PCBs	None detected
Gut G-2	085252-ESI	03/13/86	Soil	ESI/ICMI	53363	VOCs; SVOs; PCBs	Methylene chloride (0.015[B])
Gut G-3	085253-ESI	03/13/86	Soil	ESI/ICMI	53364	VOCs; SVOs; PCBs	Chloroform (0.0082[B]); ethylbenzene (0.0028J); toluene (0.0044[B])
Gut	085251 Cut Background	03/13/86	Soil	USEPA/USEPA	NA	Pest/PCBs; VOCs; SVOs; metals; dioxins	BBP (1); DNOP (17); As (2J); Cr (10); Cu (40); Ni (19); Se (1J); Zn (100)
Gut	085252 Lab waste pit seep	03/13/86	Soil	USEPA/USEPA	NA	Pest/PCBs; VOCs; SVOs; metals; dioxins	DNOP (9); As (1J); Cr (22); Cu (45); Ni (20J); Sb (10); Zn (63)

Table D-6
Summary of ICC Environmental Sampling
Background, River Gut and Drains
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Area	Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Gut	085253 Drainage pit discha.	03/13/86	Soil	USEPA/USEPA	NA	Pest/PCBs; VOCs; SVOs; metals; dioxins	Xylene (0.47); DNOP (7.7); 1,4-DCB (0.87); 1,2-DCB (2.9); naphthalene (3.1)fluorene (2.0); phenanthrene (2.4); As (0.8J); Be (8J); Cr (52); Cu (52); Pb (30J); Pb (30J); Ni (32); Se (1J); Zn (360)
Gut 500' Downstream	VI25-SED1	02/28/91	Sediment	USEPA/Compu-Chem	BGL	Pest/PCBs; VOCs; SVOs; metals; dioxins	Dieldrin (J); endrin (J); 4,4'-DDT (J); Al (15,700); As (J); Ba (90.3); Ca (45,600); Cr (18.7J); Co (14.7); Cu (46.4); Fe (25,700); Pb (15.1); Mg (7,600); Mn (954); Ni (10.8J); K (J); Na (J); V (82.4); Zn (53.9J)
Gut Lab Drain	VI25-SED2[4]	02/28/91	Sediment	USEPA/Compu-Chem	BGL	Pest/PCBs; VOCs; SVOs; metals; dioxins	Al (32,400); Sb (J); As (3.2J); Ba (115); Ca (74,900); Cr (16.3J); Co (23.7); Cu (60.5); Ge (35,8000); Pb (7.5); Mg (10,900); Mn (1,320); Ni (13.8J); K (1,490); Na (1,640J); V (62.1); Zn (73.5J)
Gut Upstream	VI25-SED3	02/28/91	Sediment	USEPA/Compu-Chem	BGL	Pest/PCBs; VOCs; SVOs; metals; dioxins	Al (30,400); Sb (J); As (4.1J); Ba (111); Be (J); Ca (79,900); Cr (17.6J); Co (24.8); Cu (62); Fe (39,200); Pb (7.5); Mg (11,800); Mn (1,400); Ni (14.6J); K (J); Na (J); V (63.2); Zn (82.3J)
Gut Lab Drain Dup	VI25-SED4[4]	02/28/91	Sediment	USEPA/Compu-Chem	BGL	Pest/PCBs; VOCs; SVOs; metals; dioxins	Al (33,600); As (3.8J); Ba (122); Ca (82,100); Cr (16.8J); Co (25.4); Cu (64.8); Fe (38,400); Pb (7.8); Mg (11,800); Mn (1,430); Ni (15.2J); K (1,600); Na (1,750J); V (64.8); Zn (79.9J)

Table D-6
Summary of ICC Environmental Sampling
Background, River Gut and Drains
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Area	Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Central Storm Drain at Process Pit	VI25-SED5	02/28/91	Sediment	USEPA/Compu-Chem	BGL	Pest/PCBs; VOCs; SVOs; metals; dioxins	2-Butanone (0.085J); xylenes (0.086J); naphthalene (J); 2-methylnaphalene (0.63J); acenaphthylene (J); fluoranthene (J); phenanthrene (J); di-n-butyl phthalate (J); fluoranthene (J); pyrene (J); butylbenzylphthalate (J); bis (2-ethylhexyl) phthalate (2.2J); y-BHC (J); aldrin (0.012J); heptachlor epoxide (0.0048J); endosulfan I (0.004J); dieldrin (0.0041J); 4,4'-DDT (J); methoxychlor (J); a-chlordane (0.0035J); y-chlordane (0.0061J); A1 (9,400); Sb (26.6J); As (8J); Ba (48.6); Ca (51,200); Cr (57.6J); Co (13.8); Cu (367); Fe (183,000); Pb (466); Mg (4,740); Mn (925); Ni (47.8J); K (J); Na (J); V (J); Zn (1,500J)
Southern Storm Drain	VI25-SED6	02/28/91	Sediment	USEPA/Compu-Chem	BGL	Pest/PCBs; VOCs; SVOs; metals; dioxins	2-Butanone (0.15); xylenes (J); pyrene (J); a-BHC (0.0077J); aldrin (0.02J); dieldrin (0.01J); 4,4'-DDE (0.024J); endosulfan II (0.0095J); methoxychlor (J); y-chlordane (0.016J); A1 (10,600); Sb (J); As (5.5J); Ba (95.8); Cd (4.5); Ca (42,100); Cr (110J); Co (17.3); Cu (109); Fe (121,000); Pb (187); Mg (5,000); Mn (1,420); Ni (49.8J); K (J); Na (J); V (J); Zn (1,710J)

Table D-6
Summary of ICC Environmental Sampling
Background, River Gut and Drains
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Area	Sample Name	Sample Date	Matrix	Collect by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Gut Lab Drain	VI25-S6	02/28/91	Soil	USEPA/Compu-Chem	BGL	2-Butanone (0.018J); trichloroethene (0.21J); pentachloorophenol (J); Al (19,200); As (J); Ba (113); Ca (18,000); Cr (20J); Co (19.5); Cu (43.7); Fe (2,500); Na (J); V (84.9); Zn (44.3J)	Al (32,400); Sb (J); As (3.2J); Ba (115); Ca (74,900); Cr (16.3J); Co (23.7); Cu (60.5); Ge (35,8000); Pb (7.5); Mg (10,900); Mn (1,320); Ni (13.8J); K (1,490); Na (1,640J); V (62.1); Zn (73.5J)

Notes:

[1] Reported concentrations in parentheses, presented in parts per million (ppm). See Table C-7 for list of chemical abbreviations.
[2] Laboratory reported fluorethyne "possibly from plastic bag"
[3] ESI report indicates these samples were collected on January 30 and 31, 1986 (ESI, 1987, p.11)
[4] Samples VI25-SED2 and VI25-SED4 were duplicate samples.
B Substance reported in blank
J Estimated concentration
[T] Tentatively identified compound
SVO Semivolatile organic compound
BTEX Benzene, toluene, ethylbenzene and xylenes
GW Groundwater
PCB Polychlorinated biphenyls
Pest Pesticides
VOC Volatile organic compound

303722

Table D-7
Summary of ICC Environmental Sampling
Water Samples
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Area	Sample Name	Sample Date	Collected by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Well P-2	085256-ESI	03/13/86	ESI/ICMI	53367	Pest/PCBs; VOCs; AECs; B/Ns; metals; CN; phenol	As(0.007); Cr(0.002); Cu(0.007); Pb(0.005); Hg(0.0005); Se(0.019); Ag(0.004); Zn(0.022); CN(0.007); DNOP(0.0024J)
Well P-2	On-site well	03/13/86	USEPA/USEPA	085256	Pest/PCBs; VOCs; metals	Chloroform(0.13); DNOP(0.0039); BEHP(0.28); As(0.002J); Be(0.005J); Cd(0.003J); Cr(0.007J); Cu(0.008J); Sb(0.003J); Zn(0.02J); Hg(0.0006J)
Fairplain 6	NA	03/07/88 03/10/88	USEPA/NA	NA	NA	Chloroform(0.024)
Fairplain 9	NA	03/07/88-3/10.88	USEPA/NA	NA	NA	Chloroform(0.075 and 0.070)
VIPA 1	NA	03/07/88-03/10/88	USEPA/NA	NA	NA	Chloroform(0.0115)
VIPA 2	NA	03/07/88-03/10/88	USEPA/NA	NA	NA	Chloroform(0.0113)
Fairplain 6	NA	10/31/88-11/02/88	USEPA/NA	NA	NA	Chloroform(0.0359)
Fairplain 9	NA	10/31/88-11/02/88	USEPA/NA	NA	NA	Chloroform(0.0104 and 0.0097)
Fairplain 8	NA	10/31/88-11/02/88	USEPA/NA	NA	NA	Chloroform(0.0124)
VIPA 2	NA	10/31/88-11/02/88	USEPA/NA	NA	NA	Chloroform(<0.0016)
Fairplain 6	NA	01/17/90	USEPA/NA	NA	NA	Chloroform(0.039)
Fairplain 9	NA	01/17/90	USEPA/NA	NA	NA	Chloroform(0.025)
Fairplain 8	NA	01/17/90	USEPA/NA	NA	NA	Chloroform(0.005)
Water Tank	NA	01/17/90	USEPA/NA	NA	NA	Chloroform(0.239[2])
Fairplain 6	NA	06/25/90	USEPA/NA	NA	NA	Chloroform(0.011)

303723

Table D-7
Summary of ICC Environmental Sampling
Water Samples
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Area	Sample Name	Sample Date	Collected by/ Analyzed by	Laboratory Sample No.	Parameters Analyzed	Substances Detected[1]
Fairplain 9	NA	06/25/90	USEPA/NA	NA	NA	Chloroform(0.039)
VIPA 1	NA	06/25/90	USEPA/NA	NA	NA	Chloroform(0.002J)
VIPA 2	NA	06/25/90	USEPA/NA	NA	NA	Chloroform(<0.005)
PW-1 (south well)	VI25-GW1	02/28/91	USEPA/ Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Chloroform (0.031); BBP(J); Al(J); Ba(J); Ca(68.8); Cu(J); Fe(0.121); Pb(0.0031); Mg(43.5); Mn(J); Hg(0.002); K(J); Se(J); Na(548); V(J); Zn(J)
Fairpplain 6	VI25-GW2	02/28/91	USEPA/ Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Chloroform (0.012); phenol (J); BEHP(J); Al(J); Ba(J); Ca(69.9); Cu(J); Fe(J); Pb(0.004); Mg(48.6); Mn(0.383); K(J); Na(363); V(J); Zn(J)
Fairplain 6	VI25-GW3	02/28/91	USEPA/ Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Chloroform (0.012); Al(J); Ba(J); Ca(74.1); Cu(J); Fe(J); Pb(0.0042); Mg(50.5); Mn(0.4); Hg(0.0033); K(J); Na(374); V(J); Zn(0.0218)
Fairplain 8	VI25-GW4	02/28/91	USEPA/ Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Chloroform(0.012); BBP(J); heptachlor(J); heptachlor epoxide(J); DDE(J); endosulfan II(J); endosulfan sulfate(J); endrin ketone(J); γ-chlordane(J); Al(J); Ba(J); Ca(127); Cu(J); Fe(J); Pb(0.0039); Mg(71.6); Mn(0.0177); K(J); Na(590); V(J); Zn(J)
VIPA 1	VI25-GW5	02/28/91	USEPA/ Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Chloroform(J); 1,1,1-TCA(J); As(J); Ba(J); Ca(61.3); Cu(J); Fe(J); Pb(0.0037); Mg(40.1); Hg(0.0012J); K(J); Na(572); V(0.0503J); Zn(J)
VIPA 2	VI25-GW6	02/28/91	USEPA/ Compu-Chem	BGL	VOCs; AECs; B/Ns; Pest; PCBs; metals	Fluoranthene(0.01J); BEHP(J); Al(J); Ba(J); Ca(75.8); Cu(J); Fe(J); Pb(0.0059); Mg(58); Mn(J); Hg(0.00072J); K(J); Na(237); V(J); Zn(0.369)

Table D-7
Summary of ICC Environmental Sampling
Water Samples
Virgin Island Chemical Site, St. Croix, U.S. Virgin Islands

Notes:

1	Reported concentrations in parentheses, presented in parts per million (ppm).
2	Average concentration from three samples collected.
J	Estimated concentration
T	Tentatively identified compound
NA	Not available
B/Ns	Base/Neutral extractable compound
AECs	Acid extractable compound
Pest	Pesticides
VOCs	Volatile organic compound
BEHP	*Bis*-2-ethylhexylphthalate
BBP	Butylbenzylphthalate
DNOP	Di-n-octylphthalate
TCA	Trichloroethane
Ag	Silver
Al	Aluminum
As	Arsenic
Ba	Barium
Be	Beryllium
Ca	Calcium
Cu	Copper
Fe	Iron
Hg	Mercury
K	Potassium
Mg	Magnesium
Mn	Manganese
Na	Sodium
Pb	Lead
Se	Selenium
V	Vanadium
Zn	Zinc

303725

Table D-8
Summary of Island Chemical Disposal Activities
Island Chemical Site, St. Croix, U.S. Virgin Islands

Date	Manifest	Waste Description (from manifests)	Source	Method	Disposal Site
11/27/82	IC01	3,175 gal. Toluene	ASTs	Bulk Tanker	Inland Chemical, Puerto Rico
11/30/82	IC02	5,205 gal. Toluene	ASTs	Bulk Tanker	Inland Chemical, Puerto Rico
12/14/82	IC03, IC04	9,913 gal. Toluene	ASTs	Bulk Tanker	Inland Chemical, Puerto Rico
01/07/83	IC05, IC06	8,455 gal. Toluene	ASTs	Bulk Tanker	Inland Chemical, Puerto Rico
02/01/83	IC07, IC08	6,946 gal. Xylenes	ASTs	Bulk Tanker	Inland Chemical, Puerto Rico
1982/1983	NA NA	15,000 gal. aqueous/basic solution Metal, plastic drums and ashes from burning of fiber drums, pallets and soil	Cistern Island Chemical Cleanup	Bulk Tanker Unknown	 Disposed locally by Cruzan Envr. Services[1] East Anguilla Sanitary Landfill[1]
12/02/85	243031 243032 243033	94 drums toluene/benzene 35 drums toluene/chlorobenzene 34 drums toluene/chloroform 15 drums toluene/acetone 14 drums containing drum pieces	Process pit water and sludge; soil and drums from wastewater drain line removal; toulene containing water and soil	Drums	Chemical Waste Management, Inc., Emelle, Alabama
10/24/91	EPA Pollution Report	Various waste streams	EPA Removal Action	Various[2]	Various[2]

Notes:

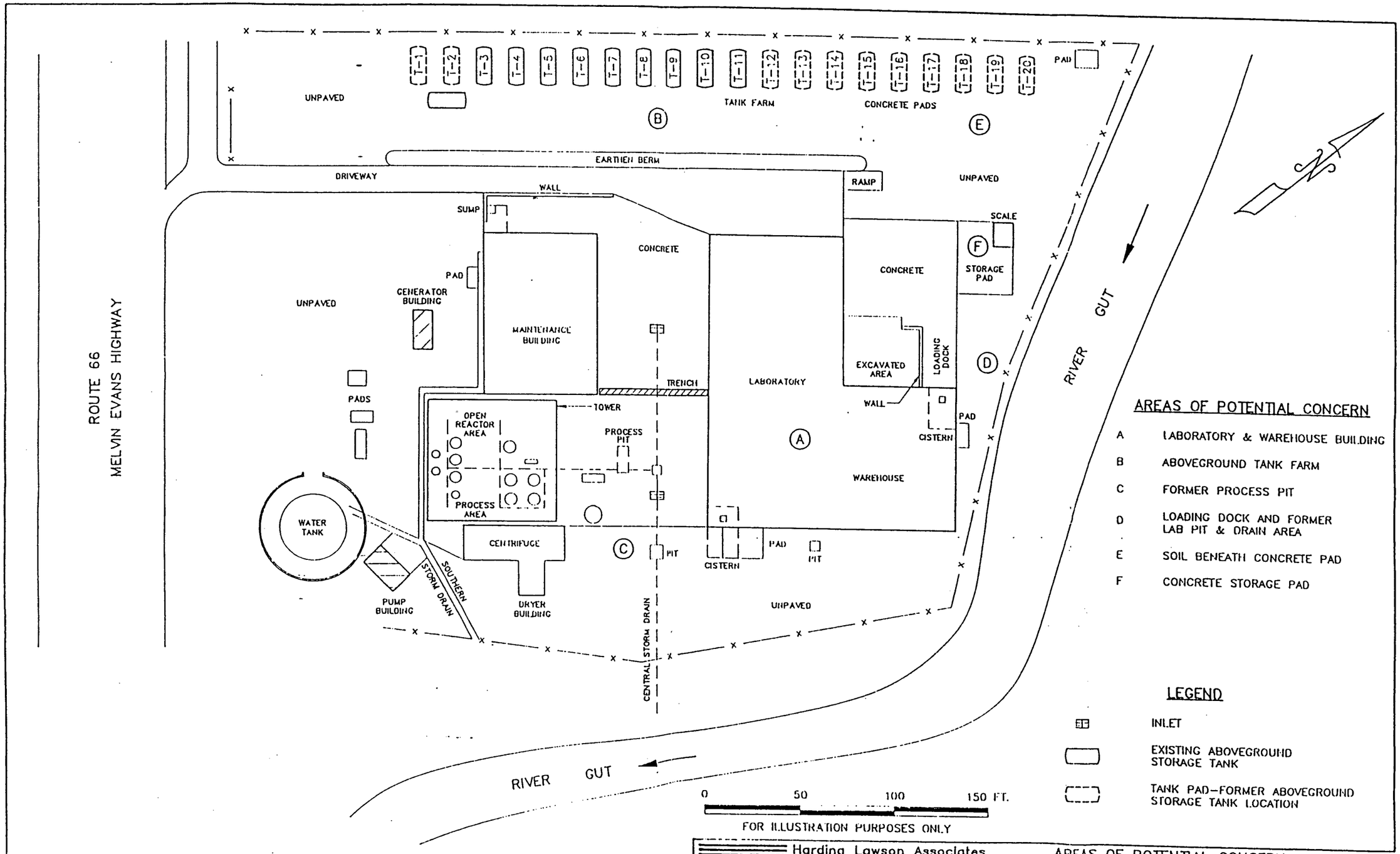
1 Information based on Island Chemical in-house memorandum dated February 7, 1983.
2 By October 24, 1991, EPA reported that all waste had been shipped offsite.
Source: Table 2-3: Harding Lawson Associates Draft RI Work Plan, 8/5/94

Table D-9
Disposition of Waste Material - EPA Removal Action
Island Chemical Site, St. Croix, U.S. Virgin Islands

Wastestream*	Medium	Quantity	Treatment	Disposal
Labpacks of Chemicals	Solid & Liquid	7990 pounds	Incineration	CWM Trade Wind Incinerator
Hazardous Cylinders	Gas	11 cylinders	Detonation	Anguilla Landfill, St. Croix
Shock-Sensitive Chem.	Solid & Liquid	70 pounds	Detonation	Anguilla Landfill, St. Croix
Uranyl Acetate	Solid	100 grams	Recycle	Polysciences, Inc.
Mercury	Solid	1 pound	Recycle	Polysciences, Inc.
"Weedox" Herbicide	Liquid	2/5 gal. Drums	On-site spraying	Vichem, St. Croix
1-Organic Liquids	Liquid	14/55 gal. Drums	Incineration	Rollins, Deer Park, TX
2-Organic Liquids	Liquid	13/55 gal. Drums	Incineration	Rollins, Deer Park, TX
3-Flam. Organic Liq.	Liquid	19/55 gal. Drums	Incineration	Rollins Deer Park, TX
4-Flam. Organic Liq.	Liquid	11/55 gal. Drums	Incineration	Rollins, Deer Park, TX
5-Base Neutral Liq.	Liquid	21/55 gal. Drums	Wastewtr. Treat.	CWM Lake Charles, La
6-Base Neutral Liq.	Liquid	17/55 gal. Drums	Incineration	Rollins, Deer Park, TX
7-Base Neutral Sol.	Solid	21/55 gal. Drums	Landfill	CWM Emelle, Ala.
7A – Base Neutral Sol.	Solid	15/55 gal. Drums	Landfill	CWM Emelle, Ala.
8 – Acid Liquids	Liquid	15/55 gal. Drums	Incineration	Rollins Deer Park, TX
9-Organic Solids	Solid	6/55 gal. Drums	Incineration	Rollins, Deer Park, TX
9A-Salicylic Acid	Solid	27/55 gal. Drums	Recycle	D&0 Chemical/Pfister Chem. Englewood, NJ/Ridgefield, NJ
10-Chlor. Orgal. Liq.	Liquid	1/55 gal. Drums	Incineration	Rollins, Deer Park, TX
11-Flam. Orgal. Liq.	Liquid	1/55 gal. Drums	Incineration	Rollins, Deer Park, TX
12-Base Neutral Liq.	Liquid	1/55 gal. Drums	Incineration	Rollins, Deer Park, TX
13-Acid Liquid	Liquid	1/55 gal. Drums	Incineration	Rollins Deer Park, TX
15-Tartaric Acid	Solid	6/55 gal. Drums	Landfill	CWM Emelle, Ala.
17-RCRA Empty Drums	Solid	240 Drums	Landfill	CWM Emelle, Ala.
20-Benzyl Chloride	Liquid	16/55 gal.drums	Recycle	D&O Chemical/Jame Fine Chem. Englewood, NJ/Bound Brook, NJ
Drained Batteries	Solid	3/85 gal. Drums	Landfill	CWM Emelle, Ala.
Battery Acid	Liquid	3/5 gal. Drums	Wastewtr. Treat.	CWM Model City, NY
Lime/Floor Sweepings	Solid	7/85 gal. Drums	Landfill	CWM Emelle, Ala.
Protective Clothing	Solid	29/85 gal. Drums	Incineration	TWI, Sauget, IL.
Protective Clothing	Soild	1/85 gal. Drums	Incineration	ENSCO, Little Rock, AR
Sample Glassware	Solid	4/5 gal. Drums	Incineration	ENSCO, Little Rock, AR

* Numbers preceding certain wastestreams identify those wastestreams according to the bulking scheme. WS #14 was a one drum wastestream the contents of which were spilled during vandalism. WS #16, 18, and 19 were Wastestreams for the St. Croix "Mini-Removals" project that were bid and disposed of with VIChem waste but charged under the St. Croix "Mini-Removals" project.

Source: EPA POLREP #30 – Final Pollution Report, 10/25/91



SOURCE:
PROPOSED ICC SOIL SAMPLING LOCATIONS BY ENVIRO-SCIENCES, INC. DATED: 6/19/86 AND
SITE MAP, VI CHEMICAL, ST. CROIX, U.S.V.I. BY NUS CORPORATION DOCUMENT 02-9101-04-SI, UNDATED

Harding Lawson Associates
Engineering and
Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

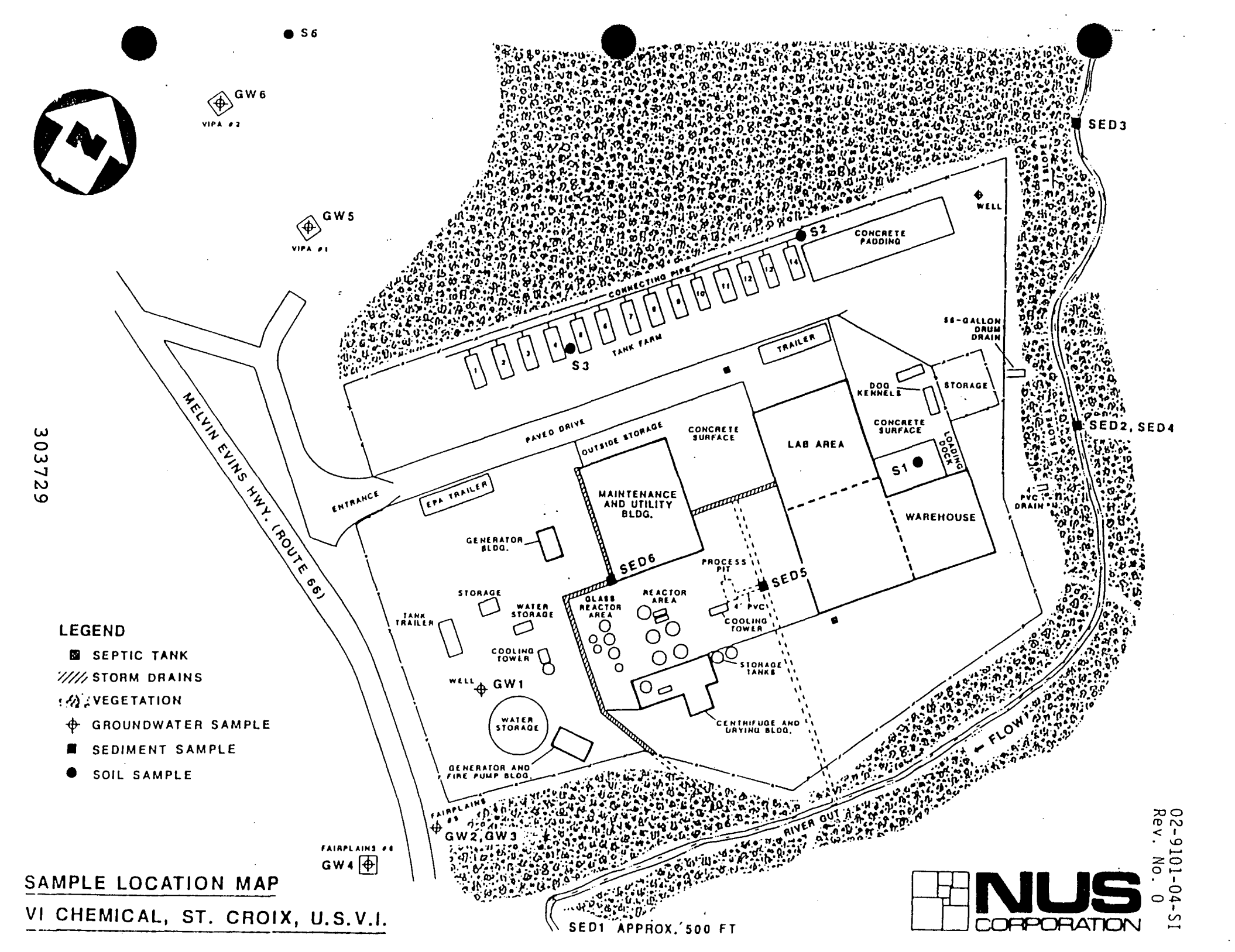
AREAS OF POTENTIAL CONCERN

VIRGIN ISLAND CHEMICAL SITE
ST. CROIX, U.S. VIRGIN ISLANDS

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	29872.13.2		29872B01	7/27/95	

FIGURE **FIGURE D-1**

303728



303729

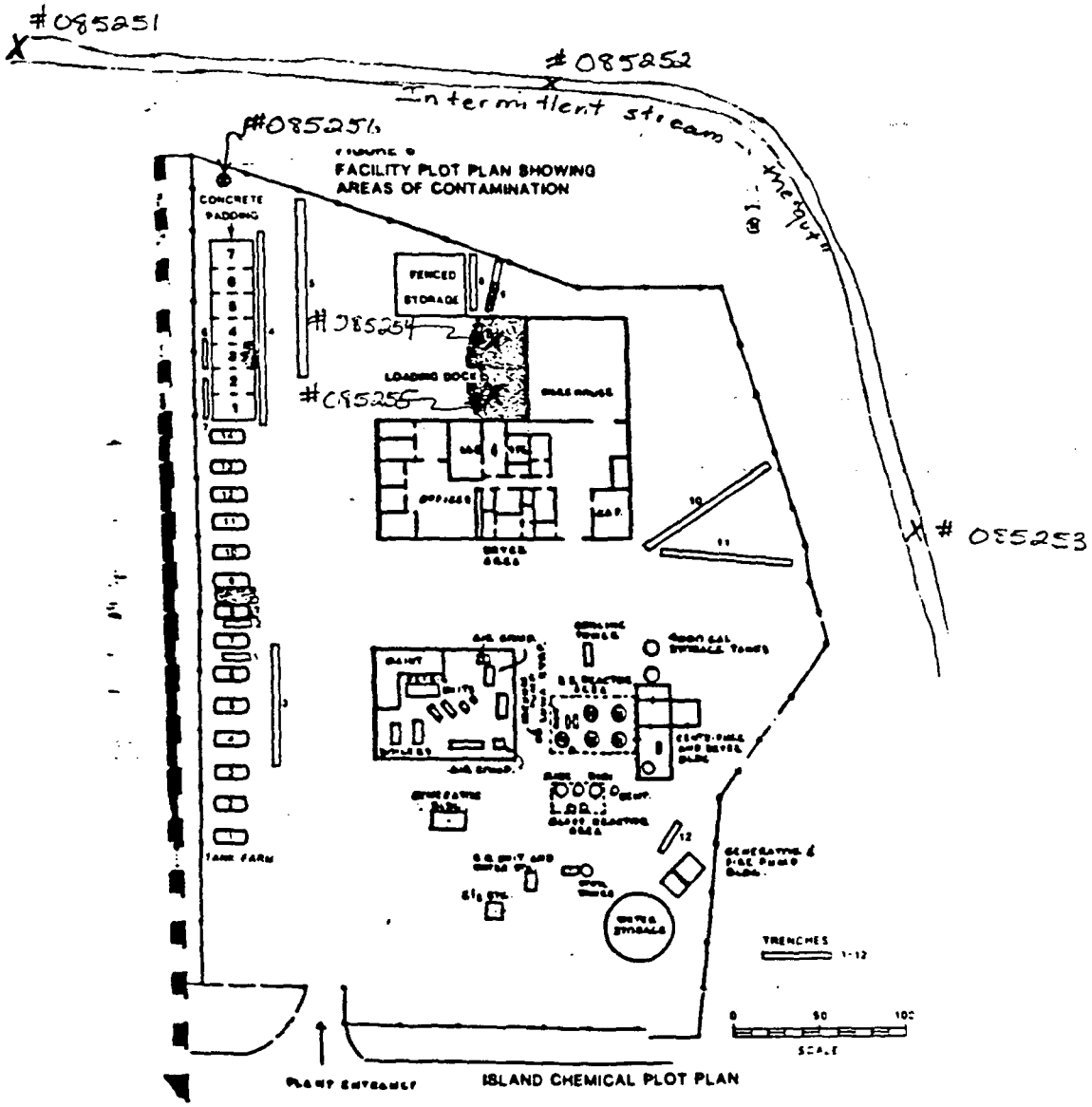
SAMPLE LOCATION MAP

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

NUS CORPORATION

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

Map of sampling points



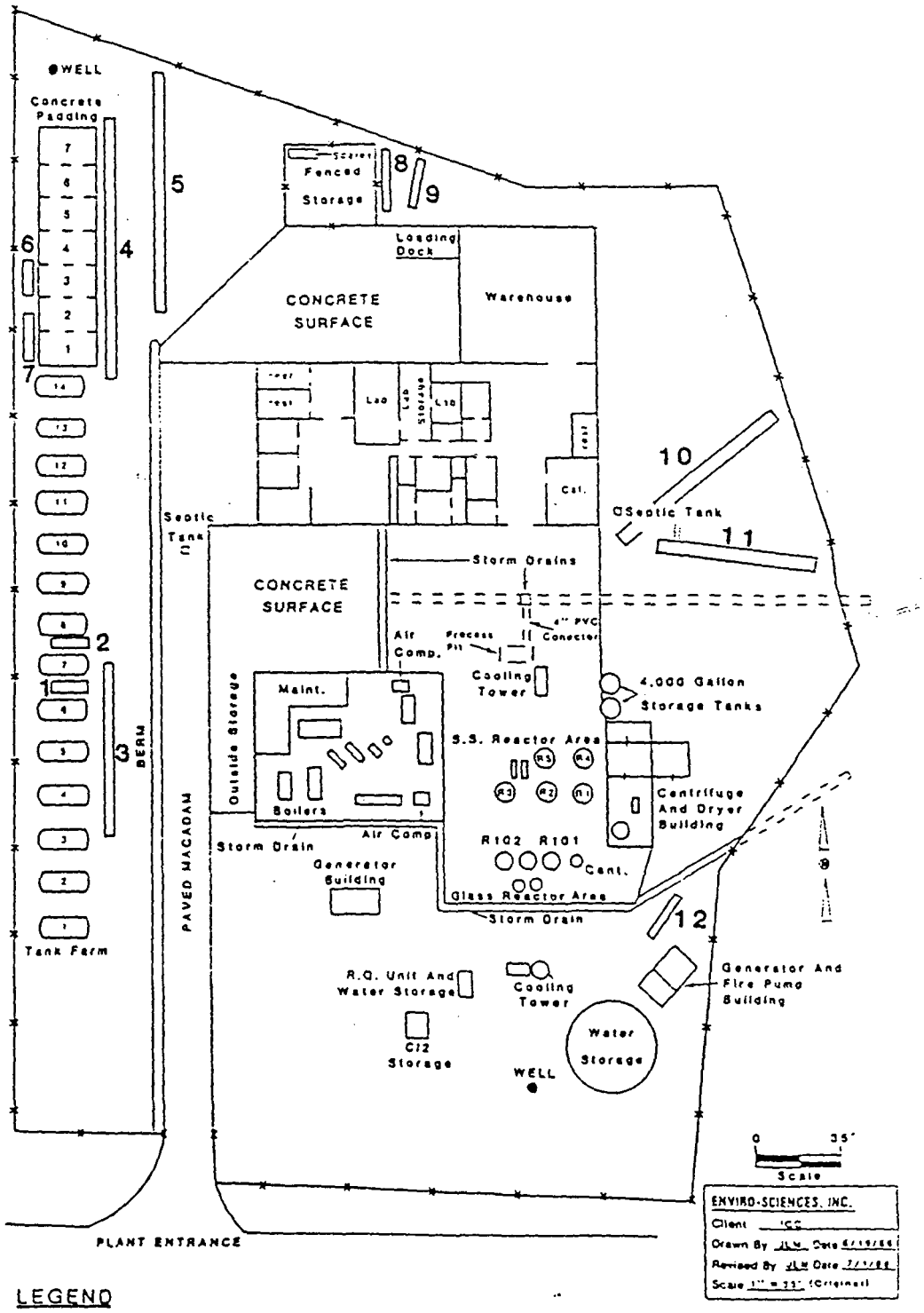
X = Sampling point

● = Production well

Not to scale.

303730

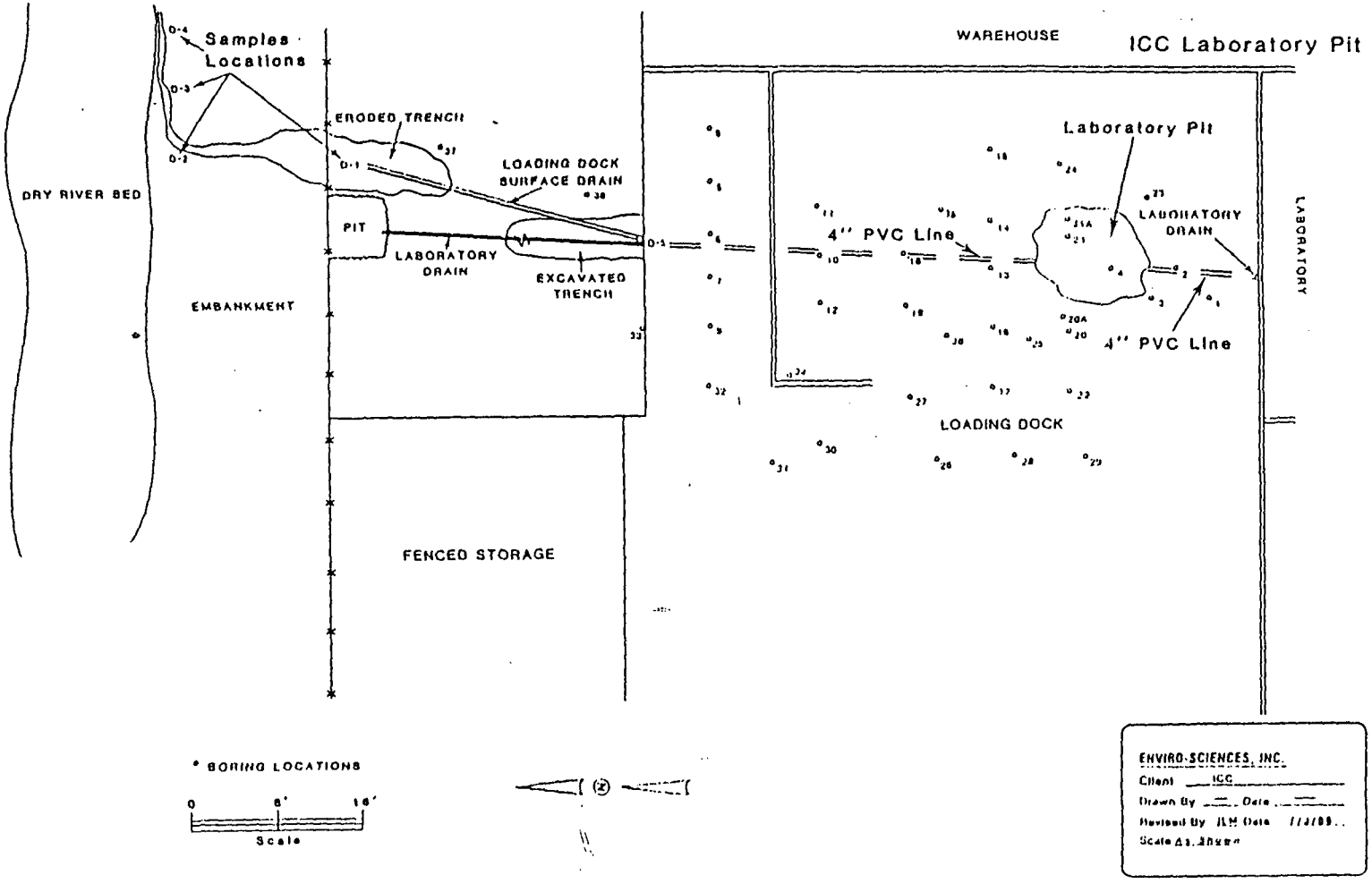
ICC Plot Plan: Trenches



LEGEND

Trenches 1-12

303731


Samples Locations
0-4
0-3
0-2
0-1
ERODED TRENCH
LOADING DOCK SURFACE DRAIN
PIT
LABORATORY DRAIN
EXCAVATED TRENCH
DRY RIVER BED
EMBANKMENT
FENCED STORAGE
WAREHOUSE
ICC Laboratory Pit
Laboratory Pit
4" PVC Line
LABORATORY DRAIN
4" PVC Line
LOADING DOCK
LABORATORY
* BORING LOCATIONS
0
8'
16'
Scale
ENVIRO-SCIENCES, INC.
Client ICC
Drawn By ___ Date ___
Revised By JLH Date 7/2/89
Scale As Shown

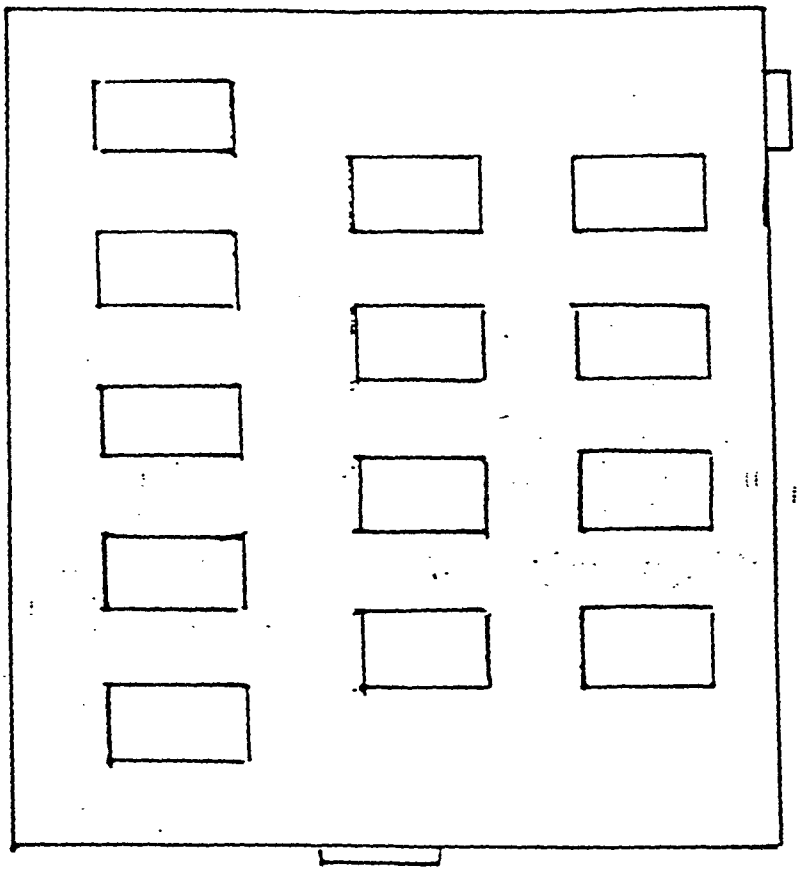
303732

St. Croix, VI

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.

Sample Location Map - Drying Oven

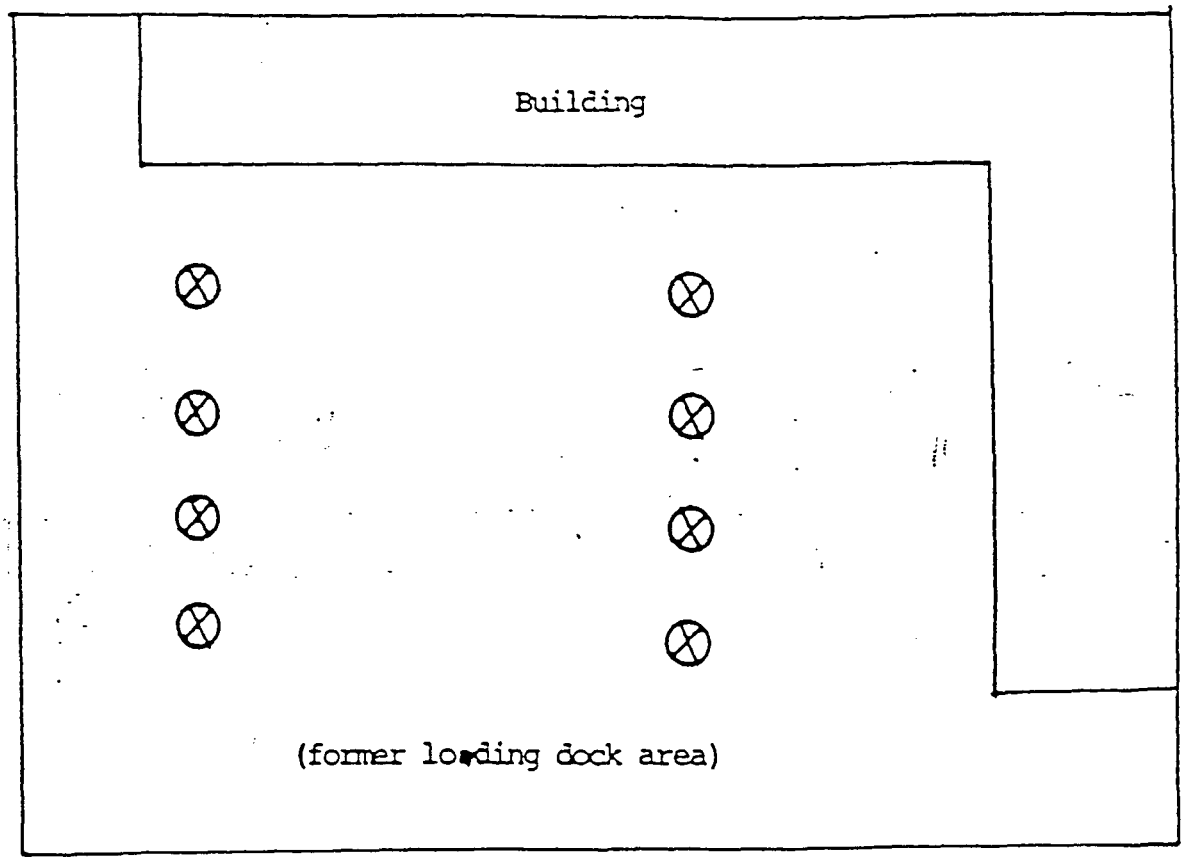
303733

Berlex Laboratories
St. Croix, VI

VID 80651095

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

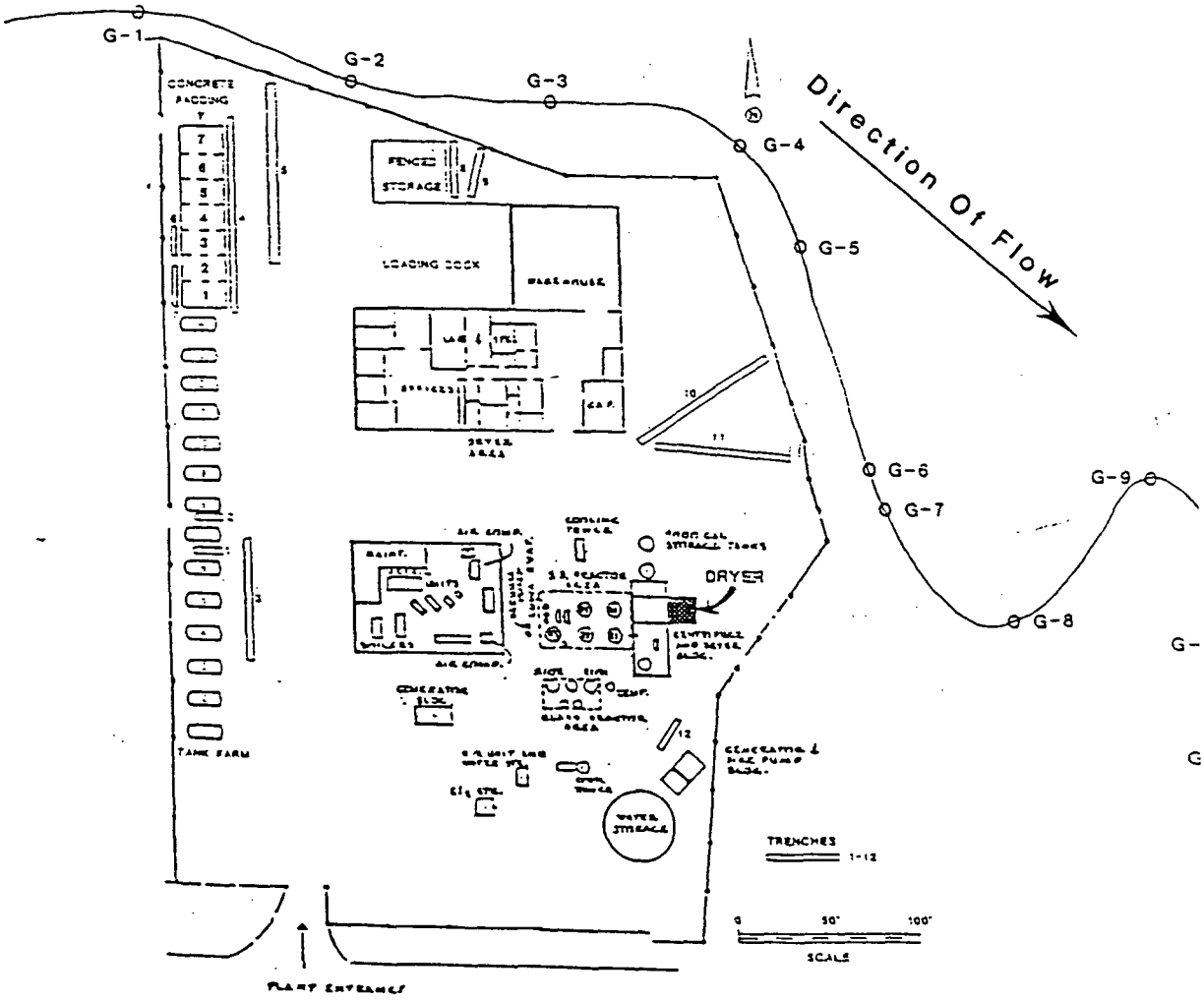
Soil sample from south side of the Lab Waste Drainage Area
- Surface - #087005
- Subsurface - #087006

(Not to Scale)

Sample Location Map - Lab Waste Drainage Area

303734

Gut Soil Sampling Program



ENVIRO-SCIENCES, INC.

Client ICC

Drawn By — Date —

Revised By JLM Date 7/3/86

Scale As Shown

303735

E

303736

APPENDIX E

1989 EPA SITE ASSESSMENT SURVEY

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 acid99%	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-hydroxybenzoin 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
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

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	liqiud
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

07/14/89

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
Phenopthalein	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	

303743

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	

303744

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	

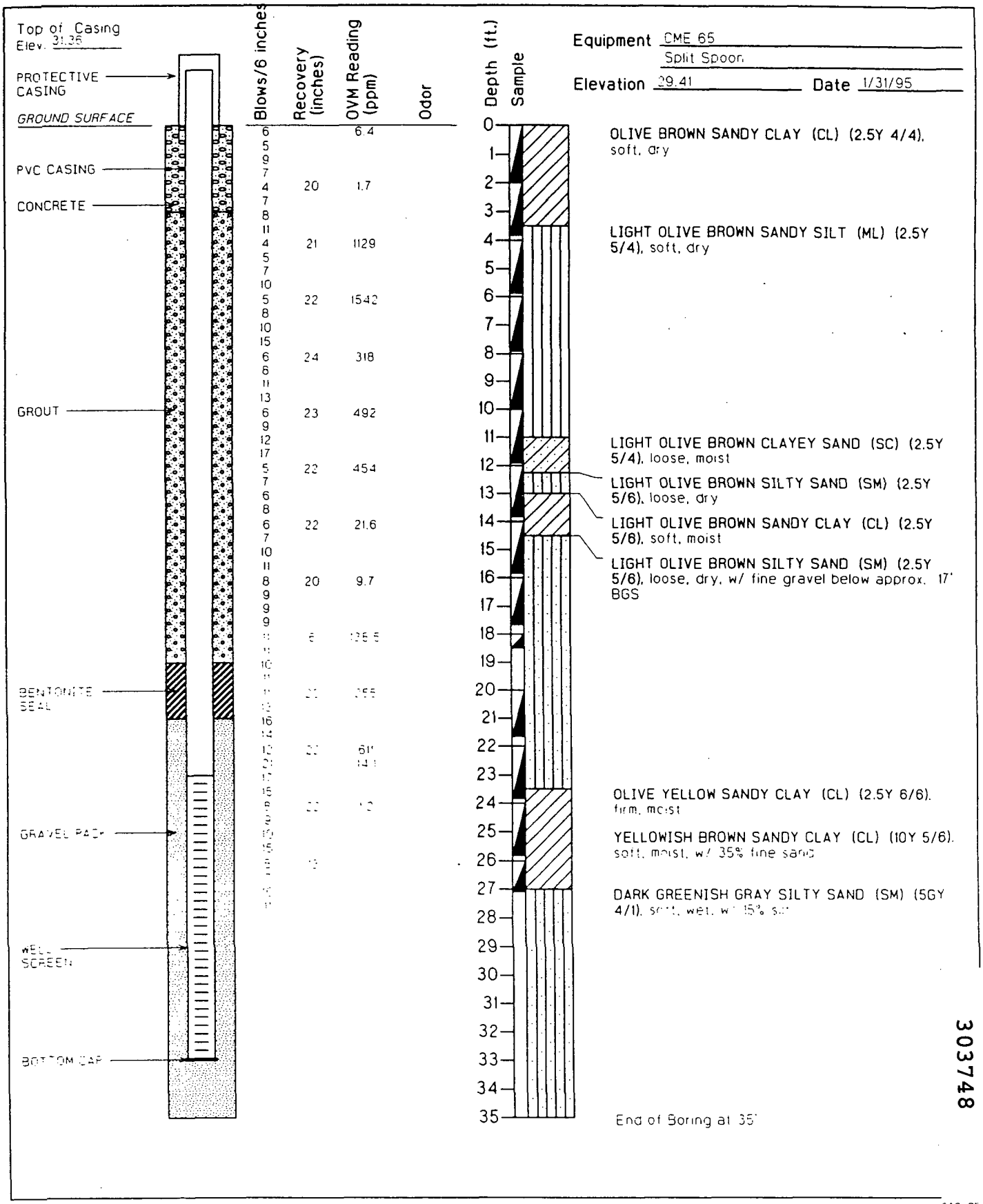
303745

F

303746

APPENDIX F

SOIL BORING LOGS



303748

FIGURE

Harding Lawson Associates
Engineering and Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

Log of Boring and Well Completion SB-B1 / MW-1
ICC
St. Croix, U.S. Virgin Islands

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		7/26/95	

Equipment CME 65
Split Spoon
Elevation Not Measured Date 1/19/95

Blows/6 inches	Recovery (inches)	OVM Reading (ppm)	Odor	Depth (ft.)	Sample	
	6			0		LIGHT OLIVE BROWN SILTY GRAVEL (GM) (2.5Y 5/3)), loose, dry
5 5 5		0		1		
				2		LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5Y 5/3), firm, dry
	16			3		
7 8 11 12		0		4		
				5		LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5Y 5/6), firm, dry
	16			6		
8 12 13 20		0		7		
				8		LIGHT OLIVE BROWN SILTY SAND (SM) (2.5Y 5/4), loose to medium dense, dry
	16			9		
10 13 15 16		0		10		
				11		
	17			12		
9 9 16 20		0		13		
				14		
				15		LIGHT OLIVE BROWN SILTY SAND (SM) (2.5Y 5/4), medium dense, dry
				16		
				17		
				18		
				19		
				20		LIGHT OLIVE BROWN CLAYEY SAND (SC) (2.5Y 5/3), medium dense, dry, wet between 22-23' BGS
				21		
				22		
				23		DARK OLIVE GRAY SANDY SILT (ML) (5Y 3/2), firm, moist
				24		OLIVE BROWN CLAYEY SAND (SC) (2.5Y 4/3), medium dense, moist
						End of Boring at 24'

FIGURE

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Engineering and
Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

Log of Boring SB-E1
ICC
St. Croix, U.S. Virgin Islands

303749

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		4/28/95	

Equipment Mobile B-55

Elevation _____ Date 05/22/96

Logged by David Kistner Checked by DJK 8/9

BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	Depth (ft.) Sample	
5 2 2 3	12	0	0	0	
2 5 7 9	18.5	0	0	2	OLIVE BROWN SILTY CLAY (CL) (2.5 Y 4/4): moist, firm, plastic, with 10-15% fine sand.
5 7 11 15	21	0	0	4	Similar to 2-4 feet.
5 10 12 16	11	0	0	6	Similar to 2-4 feet.
5 5 8 10	16	0	0	8	Similar to 2-4 feet.
9 10 11 11	19	0	0	10	OLIVE BROWN SAND (SM) (2.5 Y 4/4): moist, medium dense, medium to coarse grained sand with 10-20% gravel to 1 inch maximum.
8 13 14 23	16	0	0	12	Similar to 9.5 feet.
22 13 11 13	20	0	0	14	OLIVE SILTY CLAY (CL) (5 Y 4/4): moist, hard, with 5-10% fine sand and trace gravel.
7 16 16 21	18	0	0	16 17	
8 12 14 23	22	0	1.9	18 19	
9 9 11 14	17	163	27.3	20 21	LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5 Y 5/6): moist, hard. mostly fine sand.
6 13 16 21	16	303	118	22 23	Similar to 20-22 feet, except higher moisture content.
12 10 17 14	14	955	200	24 25 26 27 28 29 30 31 32	DARK GREENISH GRAY SAND (SM) (5 BG 4/1): wet (saturated), medium dense, medium to coarse sand with 10-20% gravel to 1 inch. Terminated boring with 3.25 inch auger at 24 feet, SPT to 26 feet. Depth to water 22.3 feet BGS at 1507 on 5/22/96. Water level probe had distinct chemical odor.

NM Not Measured

Harding Lawson Associates
Engineering and
Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

FIGURE

Log of Boring SBB2
Island Chemical Company
St. Croix, U.S. Virgin Islands

303750

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/18/96	

Equipment Mobile B-55

Elevation _____ Date 05/23/96

Logged by David Kistner Checked by DJK 8/9

BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	Depth (ft.)	Sample
4 7 8 6	9	0	0	0–4	
4 5 4 4	0	NR	NR		
4 8 11 15	19	916	80	4–8	
4 5 8 8	17	1064	>1,000		
7 8 8 9	16	1200	1500	8–10	
7 7 5 7	20	2700	3595	10–14	
6 10 14 17	20	9000	970		
10 10 10 14	8	295	1109	14–20	
5 6 8 10	20	3500	5691		
5 8 10 16	20	2589	2844		
6 14 19 28	21	2563	9145	20–22	
14 14 12 19	21	1300	9793		

No recovery.

OLIVE BROWN SILTY CLAY (CL) (2.5 Y 4/4): moist, hard, plastic, with 10-15% fine sand.

OLIVE BROWN SAND (SM) (2.5 Y 4/4): moist, medium dense, mostly fine sand with <5% medium sand.

OLIVE BROWN SANDY CLAY (CL) (2.5 Y 4/4): moist, hard, 10-20% fine to coarse sand, <5% gravel.

Sand % increases to approximately 30-35%

SANDY CLAY: similiar to 10 to 19.5 feet.

OLIVE BROWN SAND (SC) (2.5 Y 4/4): moist, dense, mostly fine sand with <10% gravel to 1 inch maximum.

Gravel % increases to approximately 25%, and wet (saturated).

Terminated boring with auger at 22 feet, SPT to 24 feet. Depth to water 21.4 feet BGS at 1135.

NM Not Measured

FIGURE

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Engineering and
Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring SBB4

Island Chemical Company

St. Croix, U.S. Virgin Islands

303751

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/18/96	

Equipment Mobile B-55

Elevation _____ Date 05/29/96

Logged by David Kistner Checked by DJK 8/9

BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	Depth (ft.) Sample	
4 6 13 8	10	0	0.6	0–1	
				1–2	
				2–3	
				3–4	
				4–5	
				5–6	
				6–7	
				7–8	
				8–9	
				9–10	
7 4 5 7	19	497	35.8	10–11	LIGHT OLIVE BROWN SILTY SAND (SM)
				11	OLIVE BROWN SILTY SANDY CLAY (CL)
6 8 11 12	18	2516	224	12–13	OLIVE BROWN SANDY CLAY
				13–14	
				14–15	
				15–16	
				16–17	
				17–18	
				18–19	
				19–20	
NM	17	2603	190	20–21	OLIVE BROWN SANDY CLAY
				21–22	
				22–23	OLIVE BROWN CLAYEY SAND (SC): fine to medium grained.
				23–24	
				24–25	
				25–26	
				26–27	
				27–28	
				28–29	
				29–30	
				30–31	
				31–32	

NM Not Measured

FIGURE

Harding Lawson Associates
Engineering and
Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring SBB4A
Island Chemical Company
St. Croix, U.S. Virgin Islands

303752

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/18/96	

Equipment Mobile B-55

Elevation _____ Date 05/23/96

Logged by David Kistner Checked by DJK 8/9

BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	Depth (ft.) Sample	
3	NM	0	0	0	
3 6 8				1	
7 5 7 10	16	0	0	2	OLIVE BROWN SILTY CLAY (CL) (2.5 Y 4/4): moist, firm, with 10-20% fine to medium sand, plastic.
6 8 10 17	16	0	0	3 4 5	Similar to 2-4 feet.
5 7 9 12	15	0	0	6 7	Similar to 2-4 feet.
4 5 7 10	4	0	0	8 9	Similar to 2-4 feet.
4 6 9 10	18	0	0	10 11	Similar to 2-4 feet, color changes at 11.5 feet to OLIVE (5 Y 4/4).
4 5 7 9	20	0	0	12 13	
6 9 18 14	12	0	0	14 15	
8 11 14 18	22	0	0	16 17	OLIVE CLAYEY SAND (SC) (5 Y 4/4): moist, dense, fine to medium sand with <10% gravel. OLIVE BROWN SANDY CLAY (CL) (2.5 Y 4/4): moist, hard, mottled brown and olive.
7 11 12 15	22	0	0	18 19	Similar to 16-18 feet.
4 7 9 12	22	0	0	20 21	Similar to 16-18 feet.
15 21 21 23	21	0	0	22 23	OLIVE CLAYEY SAND (SC) (5 Y 4/4): moist, dense, medium to coarse sand with 25-30% gravel to 1 inch.
12 20 14 18	20	0	0	24 25	OLIVE GRAVELLY CLAY (CL) (5 Y 4/4): moist, hard, 15-25% gravel to 1.5 inch.
10 14 19 24	22	0	0	26 27	LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5 Y 5/6): moist, hard, 25-40% sand (medium to coarse grained).
5 8 16 16	23	NM	NM	28 29	Similar to 26-28 feet, but wet with 5-10% gravel to 1" maximum.
				30 31 32	Terminated boring with auger at 28 feet, SPT to 30 feet. Depth to water 28.4 feet BGS at 0915 on 5/24/96.

NM Not Measured

FIGURE

Harding Lawson Associates
Engineering and
Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring SBB6
Island Chemical Company
St. Croix, U.S. Virgin Islands

303753

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/18/96	

Equipment Mobile B-55

Elevation _____ Date 05/29/96

Logged by David Kistner Checked by DJK 8/9

Depth (ft.) Sample	BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	
0–2	3 3 5 7	8	0	0	LIGHT OLIVE BROWN SILTY SAND (SM) (2.5 Y 5/6): moist, medium dense, fine to medium sand with 0.5 inch long gravel at tip of spoon.
12–14	5 5 7 8	21	0	0	GRAYISH GREEN SANDY CLAY: moist, firm, plastic.
22–24	9 14 15 15	19	0	0	GRAYISH GREEN CLAYEY SAND (SC/CL): moist, dense, fine to medium sand, 10–25% gravel to 1.25 inches maximum, slightly plastic.
26–28	10 14 15 25	NM	0	0	LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5 Y 5/6): moist, very hard, 20–40% fine to coarse sand.

NM Not Measured

FIGURE

Harding Lawson Associates
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Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring SB86A
Island Chemical Company
St. Croix, U.S. Virgin Islands

303754

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/10/96	

Equipment Mobile B-55

Elevation _____ Date 05/24/96

Logged by David Kistner Checked by DJK 8/9

BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	Depth (ft.)	Sample	
3	20	0	5.7	0		OLIVE BROWN SILTY CLAY (CL) (2.5 Y 4/4): moist, soft, 10-20% fine to medium sand, plastic, with dark brown mottling.
3 2 2				1		
3 3 8 9	20	0	47	2 3		Similar to 0 to 2 feet, but firm from 3 to 4 feet.
4 6 7 9	20	683	225	4 5		Similar to 0 to 2 feet.
4 6 8 11	16	1056	3750	6 7		OLIVE BROWN SANDY CLAY (CL) (2.5 Y 4/4): moist, firm, 10-30% fine to medium sand.
5 6 7 10	23	514	230	8 9		Similar to 6 to 8 feet, but sand percentage decreases with depth and sand becomes finer.
3 6 8 8	21	235	NM	10 11		Similar to 6 to 8 feet but with some black mottling.
7 8 9 9	19	783	1664	12 13		OLIVE BROWN CLAYEY SAND (SC) (2.5 Y 4/4): moist, medium dense, medium to coarse sand with some caliche, slightly plastic.
5 7 9 10	20	995	6024	14 15		Similar to 12.25 to 14 feet but fine to medium sand.
5 6 8 11	18	1095	7249	16 17		OLIVE BROWN SAND (SM) (2.5 Y 4/4): moist, medium dense, medium to coarse sand.
8 11 14 12	17	1084	7672	18 19		Similar to 16 to 18 feet.
9 12 15 18	19	6856	605	20 21		OLIVE BROWN CLAYEY GRAVELLY SAND (SC) (2.5 Y 4/4): moist, dense, medium to coarse sand with gravel to 1 inch maximum.
	15	3645	NM	22	▽	Similar to 20 to 22 feet but wet. Appearance like weathered rock.
				23 24		Terminated boring with 3.25 inch auger at 22 feet, SPT to 24 feet. Depth to water 22.6 feet BGS at 1235 on 5/24/96.
				25 26 27 28 29 30 31 32		

NM Not Measured

FIGURE

Harding Lawson Associates
Engineering and Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring SBB11
Island Chemical Company
St. Croix, U.S. Virgin Islands

303755

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/18/96	

Equipment Mobile B-55

Elevation _____ Date 05/30/96

Logged by David Kistner Checked by DJK 8/9

BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	Depth (ft.)	Sample	
3 1 2 3	8	0		0–2		OLIVE GRAY SANDY CLAY (CL) (5 Y 4/2): moist, soft, 10–15% fine to medium sand.
5 5 8 9	19	108		14–15		OLIVE BROWN SANDY CLAY (CL) (5 Y 4/2): moist, firm, mostly fine sand.
				15–16		GRAYISH GREEN CLAYEY SAND (SC/CL): moist, medium dense, mostly fine sand.
6 8 12 17	18	3978		20–21		OLIVE BROWN SANDY CLAY (CL): moist, firm, sand is mostly fine.
				21–22		OLIVE BROWN CLAYEY SILTY SAND (SM/SC): medium to coarse grained sand with 10–15% gravel to 0.75 inch maximum.

FIGURE

Harding Lawson Associates
Engineering and
Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring SBB11A/11B
Island Chemical Company
St. Croix, U.S. Virgin Islands

303756

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/18/96	

Equipment Mobile B-55

Elevation _____ Date 05/28/96

Logged by David Kistner Checked by DJK 8/9

BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	Depth (ft.) Sample	
6 3 5 6	12	0	0	0–2	LIGHT OLIVE BROWN SILTY CLAY (CL) (2.5 Y 5/6): moist, firm, with 10–20% fine to medium sand, plastic.
3 3 6 8	9	0	0	2–4	Similar to 0 to 2 feet, but color changes to dark olive brown 2.5 Y 3/3.
4 8 12 14	17	0	0	4–6	Similar to 0 to 2 feet, but color changes to olive brown 2.5 Y 4/4, hard.
6 9 12 18	14	0	0	6–8	Similar to 4 to 6 feet.
5 9 13 20	13	0	0	8–10	Similar to 4 to 6 feet.
7 9 10 10	15	0	0	10–12	OLIVE BROWN SAND (SM) (2.5 Y 4/4): moist, dense, medium to coarse sand with 10–20% gravel to 0.75 inch maximum.
9 8 14 15	18	0	0	12–14	DARK GREENISH GRAY GRAVELLY SAND (SM) (5 GY 4/1): moist, dense, 20–40% gravel to 1 inch maximum, medium to coarse sand.
13 13 12 11	18	0	0	14–16	DARK GREENISH GRAY SANDY CLAY (CL) (5 GYT 4/1): moist, hard, fine to medium sand, 10–20% gravel to 1.5 inches maximum.
5 9 11 16	15	0	0	16–18	OLIVE SANDY CLAY (CL) (5 Y 4/3): moist, hard, 15–30% fine to medium sand.
6 10 12 16	22	0	0	18–20	Similar to 16 to 18 feet.
5 8 9 14	24	0	0	20–22	Similar to 16 to 18 feet except color varies from olive to dark greenish gray (5 G 4/1).
6 7 10 12	24	0	0	22–24	Similar to 16 to 18 feet except sand is mostly fine, (CL/SC), sand increases to 30–50%, greenish gray mottling.
5 8 11 12	24	0	0	24–26	Similar to 22 to 24 feet.
6 9 11 14	24	0	0	26–28	LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5 Y 5/6): moist, hard.
7 8 11 14	24	0	0	28–30	OLIVE YELLOW SANDY CLAY/CLAYEY SAND (CL/SC): similar to 22 to 24 feet except no greenish gray mottling.
4 7 15 14	NM	0	0	30–32	OLIVE YELLOW CLAYEY SAND (SC): moist, dense, medium to coarse sand with 5–15% gravel to 0.5 inch maximum.
				32	Terminated boring at 1250 with auger at 30 feet, SPT to 32 feet. Saturated soil not encountered during drilling. Depth to water=24.1 feet BGS at 1415 (1.5 hours after stop drilling).

NM Not Measured

FIGURE

Harding Lawson Associates
Engineering and
Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring SBB15
Island Chemical Company
St. Croix, U.S. Virgin Islands

303757

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/18/96	

Equipment Mobile B-55

Elevation _____ Date 05/28/96

Logged by David Kistner Checked by DJK 8/9

BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)	Depth (ft.) Sample	
4 10 8 7	9	0	0	0–2	VERY DARK BROWN SANDY CLAY (CL) (7.5 Y 2.5/3): moist, firm with 20-30% gravel to 1.5 inches maximum.
5 3 3 4	12	0	0	2–4	Similar to 0 to 2 feet, except <10% gravel, sand is fine to medium.
5 5 8 10	15	0	0	4–6	PALE OLIVE SANDY CLAY/CLAYEY SAND (CL/SC) (5 Y 5/4): moist, medium firm, sand is mostly fine, orange brown concretion (oxidized mineral?).
5 6 9 11	9	0	0	6–8	OLIVE BROWN SANDY CLAY (CL) (2.5 Y 4/4): moist, firm, fine sand, plastic.
4 6 9 10	NM	0	9.9	8–10	OLIVE SANDY CLAY (CL) (5 Y 4/4): moist, firm, plastic.
4 6 9 12	21	0	3.7	10–12	Similar to 8 to 10 feet.
4 6 8 9	20	0	6.2	12–14	GRAYISH GREEN SANDY CLAY (CL) (5 G 4/2): moist, firm, plastic.
6 6 7 8	22	15.9	8.7	14–16	Similar to 12 to 14 feet except higher sand percentage, (25-50%), predominately fine sand.
8 11 15 19	16	19.9	3.7	16–19	GRAYISH GREEN CLAYEY SAND (SC): moist, dense.
9 10 12 14	18	1.2	4.9	19–20	OLIVE BROWN SANDY CLAY (CL) (2.5 Y 4/4): moist, firm, plastic.
4 8 10 12	23	0	2.4	20–22	Similar to 19 to 20 feet but with grayish green mottling.
12 18 18 22	22	2.4	1.2	22–24	Similar to 19 to 20 feet but sand is medium grained and higher percentage (15-25%) and 10-15% gravel to 1 inch maximum.
11 13 13 17	12	1.2	2.3	24–26	▽ Similar to 22 to 24 feet (CL/SC), but appears wet at tip. End of boring. Depth to water 24.4 feet BGS at 0830 5/29/96.

NM Not Measured

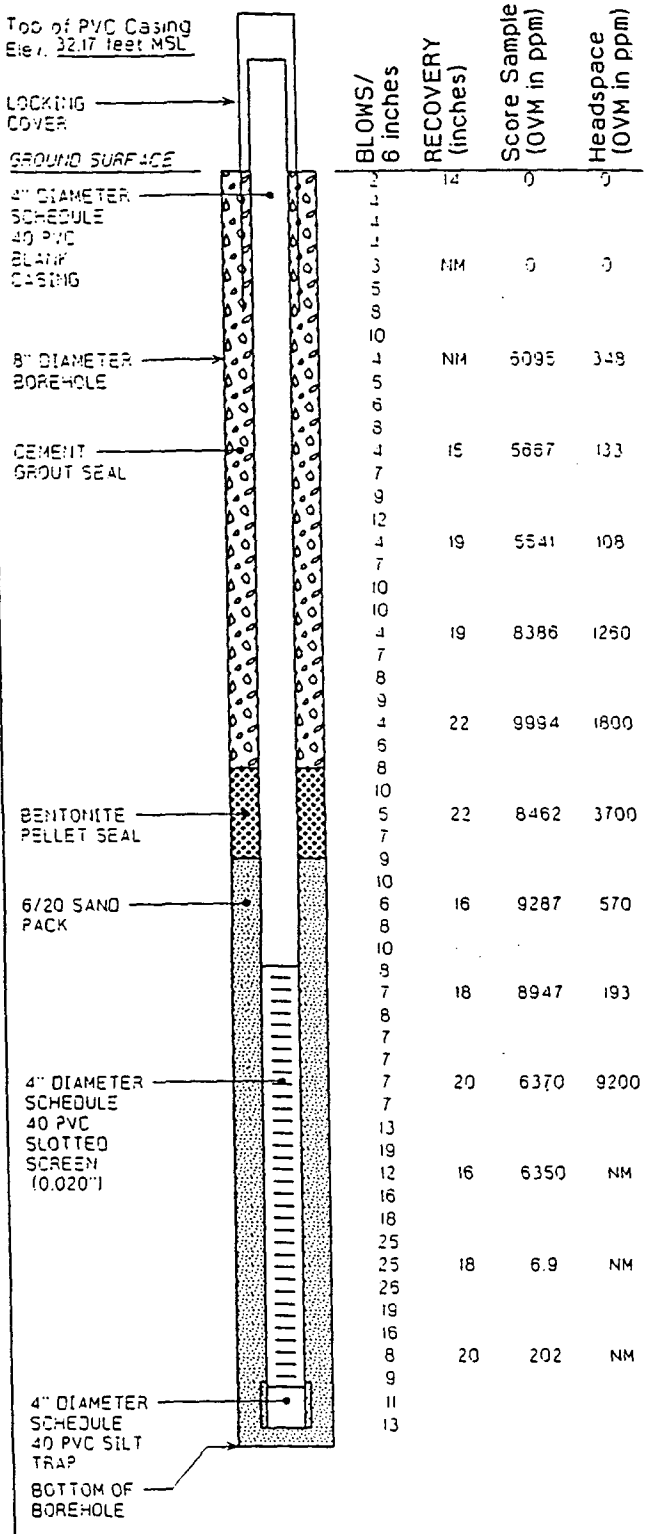
FIGURE

Harding Lawson Associates
Engineering and
Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring SBB16
Island Chemical Company
St. Croix, U.S. Virgin Islands

303758

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/18/96	



Depth (ft.) Sample	BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)
0	2 2 3	14	0	0
1	4 4 3			
2	3 5 8	NM	0	0
3	10 4 5	NM	6095	348
4	6 8 4	15	5667	133
5	7 9 12	19	5541	108
6	4 7 10	19	8386	1260
7	10 4 7	22	9994	1800
8	8 9 4	22	8462	3700
9	6 8 10	16	9287	570
10	5 7 9	18	8947	193
11	10 6 8	20	6370	9200
12	10 8 7	16	6350	NM
13	7 7 7	18	6.9	NM
14	13 19 12	20	202	NM
15	16 18 25			
16	25 25 19			
17	16 8 9			
18	11 13			
19				
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31				
32				

Equipment Mobile B-55

Elevation 29.80 ft MSL Date 05/31/96

Logged by David Ashner Checked by DJK 3/9

LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5 YR 5/3): moist, firm.

LIGHT OLIVE SANDY CLAY (CL) (2.5 Y 5/4): moist, firm, sand is mostly fine grained.

Similar to 2 to 4 feet.

OLIVE SANDY CLAY (CL) (5 Y 4/4): moist, hard, plastic, sand is fine grained.

Similar to 6 to 8 feet.

Similar to 6 to 8 feet.

Similar to 6-8 feet, but sand increases to 20 to 40%, mostly fine grained sand.

OLIVE BROWN CLAYEY SAND (SC) (2.5 Y 4/4): moist, medium dense with 10 to 15% gravel to 1 inch max.

OLIVE BROWN SILTY SAND (SM) (2.5 Y 4/4): moist, medium dense, medium to coarse sand with 5-10% gravel to 0.5 inch max.

Similar to 18-20 feet but higher gravel % in tip of spoon.

OLIVE BROWN GRAVELLY CLAY (CL/GC) (2.5 Y 4/4): wet, hard, 20 to 40% gravel to 1 inch max.

OLIVE YELLOW CLAYEY SAND/SANDY CLAY (SC/CL) (2.5 Y 6/8): wet, hard, fine to coarse sand, slightly plastic (looks like weathered granite).

OLIVE YELLOW CLAYEY SAND (SC) (2.5 Y 6/8): wet, medium dense, mostly fine sand, slightly plastic. Color changes to olive (5 Y 5/6) between 27.2-28.0 feet.

Terminated SPT sampling at 28 feet BGS. Pull 3.25 inch ID hollow stem augers. Ream boring with 8 inch solid stem augers to 28 feet BGS. Install 4 inch ID PVC monitoring well on May 31, 1996.

NM Not Measured

FIGURE

Harding Lawson Associates
Engineering and
Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring and Well Completion SBB17/MW-8
Island Chemical Company
St. Croix, U.S. Virgin Islands 303759

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
DJK	35241.2.12		07/10/96	

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBAST-5
PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH: SEE FIGURE 3-1

COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE:	MONITORING DEVICE:	GEOLOGIST / OFFICE:
9/12/97	23 Feet	OVM (PID)	C.Schneider/Warren

DRILLING CONTRACTOR / DRILLER:	DRILLING EQUIPMENT:	DRILLING METHOD / BIT:
Soiltech	BK-51	Hollow Stem Auger- 4 1/4"

SAMPLING METHOD:	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION:	WELL INSTALLED?
Split Spoon	22.0' bgs	NA	No

MEMO: **ABOVEGROUND STORAGE TANK AREA**

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	8	0	2 5 11 19	Firm dark brown CLAY, little/trace silt, dry.	
1					
2					
3	12	0	6 7 17 28	Firm dark brown CLAY, little silt, trace fine sand, dry.	
4					
5	15	0	6 11 16 27		
6					
7	15	0	9 18 16 25	Hard light brown/tan fine/medium SAND, dry. Hard light brown sandy CLAY, some silt, dry.	
8					
9	7	0	23 31 28 43	Hard dark brown silty CLAY, some sand, dry.	
10					
11	14	0	13 23 42 47	Hard light brown/tan CLAY, little/trace silt, little/trace limestone gravel, dry.	
12					
13	18	0	9 13 13 13	Stiff light brown/tan silty CLAY, some sand, moist. Stiff light brown sandy CLAY, dry.	
14					
15	20	0	7 11 14 19	Stiff light brown silty CLAY and fine SAND, trace limestone gravel, dry.	
16					
17	16	0	12 15 17 17	Stiff dark brown silty CLAY and SAND, moist. Stiff brown silty SAND and CLAY, some/little limestone gravel, dry.	
18					
19	9	1	11 11 16 16	Firm brown silty SAND and CLAY, some/little limestone gravel, dry.	
20					
21	12	1	15 17 17 19	Stiff light brown silty sandy CLAY, dry. Stiff brown fine/medium SAND and SILT, some clay, some/little medium gravel/grey limestone fragments, dry.	20-22' bgs. VOCs,SVOCs, METALS
22					
23	7	335	0* 0*	Hard light brown medium SAND, some grey gravel, wet. End of boring @ 23' bgs.	22-24' bgs. VOCs,SVOCs, METALS

* Hammer was pushed manually from 22' to 23' below ground surface, no blow counts.

303760

SOIL BORING LOG

McLaren Hart	PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBAST-6
	PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH
COMPLETION DATE: 9/17/97	TOTAL DEPTH OF BOREHOLE: 26 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: Soiltech	DRILLING EQUIPMENT: BK-51	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	SEE FIGURE 3-1
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER 24.0' bgs'	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: ABOVEGROUND STORAGE TANK AREA			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	15	NM	3 6 8 9	Firm light brown silty CLAY, some fine sand, dry.	Note: OVM not functioning properly during collection of samples from 0' to 8' bgs.
3	18	NM	11 14 11 12	Stiff light brown silty fine SAND, trace clay, dry.	
5	20	NM	3 12 15 24	Very stiff light brown silty SAND, trace clay, dry.	
7	24	NM	4 36 23 39	Hard light brown SAND, some fine/medium gravel, trace silt, dry.	
9	20	0	1 11 11 29	Very stiff light brown sandy CLAY, dry. Brown/grey fine/medium GRAVEL, dry. Very stiff light brown sandy CLAY, dry.	
11	20	0	3 15 24 28	Very stiff light brown/tan SAND, trace silt/clay, dry.	
13	22	0	7 11 14 18	Stiff brown silty CLAY, trace sand, dry.	
15	18	0	4 6 12 16	Stiff olive green/tan silty CLAY, trace fine sand, dry.	
17	18	0	3 10 14 21	Stiff olive green sandy SILT, moist.	
19	22	6	6 14 20 20	Stiff Olive green medium SAND, trace silt, moist.	
21	22	1	10 20 18 20	Stiff grey/brown silty CLAY and SAND, moist.	20-22' bgs. VOCs,SVOCs, METALS
23	22	0	11 29 33 36	Very stiff grey/olive green silty SAND, moist. Very stiff grey/olive green medium SAND, some gravel, moist.	22-24' bgs. VOCs,SVOCs, METALS
25	24	225	12 36 44 36	Grey medium GRAVEL, wet. Hard grey/olive green silty CLAY, moist. End of boring @ 26' bgs.	

303761

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBAST-7
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 9/18/97	TOTAL DEPTH OF BOREHOLE: 26 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: Soiltech	DRILLING EQUIPMENT: BK-51	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	SEE FIGURE 3-1
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER 24.0' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: ABOVEGROUND STORAGE TANK AREA			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	18	0	3		
1			5		
2			8 11	Stiff brown silty CLAY, little/trace fine sand, moist.	
3	24	2	4 16	Hard brown silty SAND and CLAY, dry.	
4			33 37	Hard light brown/tan fine/medium GRAVEL, some sand/clay, dry.	
5	18	8	3 17	Hard dark brown sandy CLAY, moist. Hard medium brown/tan silty fine SAND,	
6			38 38	some little clay, dry.	
7	18	10	14 21		
8			31 34	Hard brown silty hard CLAY, some/little fine sand, dry.	
9	16	4	6 9	Very stiff medium brown silty CLAY, some fine sand, trace gravel, moist.	
10			13 16		
11	16	43	5 8		
12			11 15	Firm medium brown CLAY, trace/little silt, moist.	
13	12	0	6 11	Firm grey/brown CLAY, some silt, trace carbonate	
14			14 16	gravel, dry to moist.	
15	18	0	10 12	Stiff light grey fine sandy CLAY, trace carbonate	
16			17 18	gravel, dry.	
17	24	0	15 16	Stiff mediuim light grey CLAY, some fine sand,	
18			25 29	trace carbonate gravel, dry to moist.	
19	24	3	12 14	Very stiff red/brown CLAY, trace carbonate gravel,	
20			16 16	dry to moist.	
21	18	8	8 21		20-22' bgs.
22			27 33	Stiff light brown silty CLAY, trace carbonate gravel, dry.	VOCs,SVOCs, METALS
23	14	55	31 41	Hard light grey silty SAND, dry.	22-24' bgs.
24			26 26	Hard medium GRAVEL, some sand/silt, moist.	VOCs,SVOCs, METALS
25	24	50	16 12	Hard coarse GRAVEL, some sand and clay, moist.	
26			17 32	Hard medium brown sandy CLAY, trace fine gravel. End of boring @ 26' bgs.	

303762

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBAST-10
PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH: SEE FIGURE 3-1

COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE:	MONITORING DEVICE:	GEOLOGIST / OFFICE:
12/8/97	20 Feet	OVM (PID)	C.Schneider/Warren

DRILLING CONTRACTOR / DRILLER:	DRILLING EQUIPMENT:	DRILLING METHOD / BIT:
CT&E	B-80	Hollow Stem Auger 4 1/4"

SAMPLING METHOD:	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION:	WELL INSTALLED?
Split Spoon	20.0' bgs	NA	No

MEMO: ABOVEGROUND STORAGE TANK AREA

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0					
1					
				Drilled to 16' bgs. No split spoons collected.	
16					
	8	3.3	22		
17			29		
			35	Hard brown/red CLAY, little gravel, dry.	
18			45		
	18	1.3	25	Hard olive SILT, some fine sand, little clay,	
19			37	trace gravel, dry.	18-20' bgs.
			29	Hard olive SAND and fine/medium GRAVEL,	VOCs,SVOCs, METALS
20			20	trace silt and clay, wet.	
				End of boring @ 20' bgs.	

303763

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBAST-11
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-1
COMPLETION DATE: 12/8/97	TOTAL DEPTH OF BOREHOLE: 31.2 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: NA	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: ABOVEGROUND STORAGE TANK AREA			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0					
1					
16				Drilled to 16' bgs. No split spoons collected.	
17	12	0	23 50 21	Hard olive fine SAND, some gravel, dry.	
18			24	Coarse GRAVEL, dry.	
19	18	0	13 21 14	Very stiff olive CLAY, some fine sand, dry. Very stiff olive fine SAND, trace silt, some gravel, dry.	
20			16	Very stiff tan CLAY, dry.	
21	24	0	10 17 20	Very stiff grey SILT with gravel, some fine sand, trace clay, dry. Very stiff orange and brown CLAY, trace silt, dry. Very stiff red/brown CLAY, trace sand and gravel, dry.	
22			24		
23	24	0	18 24 35	Hard red brown CLAY, dry. Hard red/brown CLAY, some sand, dry.	
24			32	Hard red/brown SAND, some clay, dry.	
25	6	0	28 38 50	Hard light brown/tan CLAY, dry. Hard tan SAND with gravel, some rock fragments, dry.	
26			NA		
27	24	0	25 33 50	Hard tan sandy CLAY, some gravel, dry.	
28			50		
29	10	0	35 50 NA	Hard tan/red CLAY, some sand, little gravel, dry.	28-30' bgs. VOCs,SVOCs, METALS
30			NA		
31	8	0	22 44 NA	Hard tan/red sandy CLAY, dry. End of boring @ 31.2' bgs.	30-32' bgs. VOCs,SVOCs, METALS

303764

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBAST-12
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-1
COMPLETION DATE: 12/9/97	TOTAL DEPTH OF BOREHOLE: 26 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: 24.0' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: ABOVEGROUND STORAGE TANK AREA			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES	DEPTH (Feet)
0						0
1						1
16				Drilled to 16' bgs. No split spoons collected.		
	12	14	27			
17			17			17
			26	Very stiff tan CLAY, trace sand and gravel, dry.		
18			28			18
	24	1	11	Stiff tan CLAY, trace sand and gravel, dry.		
19			8		18-20' bgs.	19
			12	Stiff white CLAY, dry.	VOCs,SVOCs, METALS	
20			14	Stiff tan CLAY, trace sand and gravel, dry.		20
	10	7	10	Very stiff tan CLAY, some gravel , dry - Fine SAND		
21			12	lens at 20.4' bgs.		21
			24	Very stiff olive SAND, some gravel, dry.		
22			NA			22
	24	0	9	Very stiff tan CLAY, trace gravel, dry.		
23			15	Very stiff olive silty fine SAND, trace clay, dry.	22-24' bgs.	23
			25		VOCs,SVOCs, METALS	
24			22	Very stiff olive medium-coarse SAND, trace silt, moist.		24
	24	0	11	Very stiff olive medium-coarse SAND, trace silt, wet.		
25			10			25
			13			
26			25	End of boring @ 26' bgs.		26

303765

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBAST-13
PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH: SEE FIGURE 3-1

COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE:	MONITORING DEVICE:	GEOLOGIST / OFFICE:
12/8/97	25 Feet	OVM (PID)	C.Schneider/Warren

DRILLING CONTRACTOR / DRILLER:	DRILLING EQUIPMENT:	DRILLING METHOD / BIT:
CT&E	B-80	Hollow Stem Auger- 4 1/4"

SAMPLING METHOD:	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION:	WELL INSTALLED?
Split Spoon	NA	NA	No

MEMO: **ABOVEGROUND STORAGE TANK AREA**

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES	DEPTH (Feet)
0						0
1						1
				Drilled to 16' bgs. No split spoons collected.		
16						16
	6	3	50			
17			NA	Hard brown CLAY, some gravel limestone		17
			NA	fragments, dry.		
18			NA			18
	4	100	28			
19			50		18-20' bgs.	19
			NA	Hard grey SAND, trace silt and gravel, dry	VOCs,SVOCs, METALS	
20			NA			20
	18	30	29	Very stiff grey CLAY, dry.		
21			25	Very stiff SAND,trace clay and gravel, dry.		21
			20	Very stiff grey CLAY, dry.		
22			NA			22
	24	3	24		22-24' bgs.	
23			31		Geochemical/Geotechnical	23
			41	Hard red/brown CLAY, dry.	Biological	
24			44			24
	20	14	23	Hard brown CLAY, some sand and gravel.	24-26' bgs.	
25			50	End of boring @ 25.0 bgs.	VOCs,SVOCs, METALS	25

303766

Equipment CME 65
Split Spoon
Elevation Not Measured Date 1/27/95

Depth (ft.)	Sample	Blows/6 inches	Recovery (inches)	OVM Reading (ppm)	Odor
0					
1		2 3 4 9	18	0	
2					
3		3 3 5 7	19	0	
4					
5		4 4 6 9	21	0	
6					
7		7 10 13 11	17	0	
8					
9		5 10 11 15	21	0	
10					
11		5 8 11 20	20	0	
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

CONCRETE

LIGHT OLIVE BROWN SILTY SAND (SM) (2.5Y 5/4), soft, wet

LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5Y 5/6), soft, moist

GRAYISH BROWN SILTY SAND (SM) (2.5Y 5/2), loose, wet

OLIVE YELLOW SILTY CLAY (CL) (2.5Y 6/6), soft, dry

LIGHT OLIVE BROWN SILTY SAND (SM) (2.5Y 5/6), loose, moist, medium dense at approximately 7' below ground surface

OLIVE YELLOW CLAYEY SAND (SC) (2.5Y 6/6), medium dense, moist

LIGHT YELLOWISH BROWN SANDY SILT (ML) (2.5Y 6/4), soft, moist

OLIVE YELLOW SILTY SAND (SM) (2.5Y 6/6), loose, moist

LIGHT YELLOWISH BROWN GRAVELLY SAND (SP) (2.5Y 6/3), loose, moist

OLIVE YELLOW CLAYEY SAND (SC) (2.5Y 6/6), soft, moist

OLIVE BROWN GRAVELLY SAND (SP) (2.5Y 4/4), loose, moist

OLIVE YELLOW CLAYEY SAND (SC) (2.5Y 6/6), soft, moist

OLIVE YELLOW SILTY CLAY (CL) (2.5Y 6/6), firm, moist-dry

OLIVE YELLOW SILTY SAND (SM) (2.5Y 6/6), loose, moist

FIGURE

Herding Lawson Associates
Engineering and
Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

Log of Boring SB-C1
ICC
St. Croix, U.S. Virgin Islands

303767

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		4/27/95	

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBPP-1
PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH: SEE FIGURE 3-2

COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE:	MONITORING DEVICE:	GEOLOGIST / OFFICE:
12/3/97	27 Feet	OVM (PID)	C.Schneider/Warren

DRILLING CONTRACTOR / DRILLER:	DRILLING EQUIPMENT:	DRILLING METHOD / BIT:
CT&E	B-80	Hollow Stem Auger- 4 1/4"

SAMPLING METHOD:	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION:	WELL INSTALLED?
Split Spoon	19.4' bgs	NA	No

MEMO: **PROCESS PIT**

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0					
1				Drilled to 1' bgs. No split spoons collected.	
2	0	NM	11		
			11		
			4	No Recovery.	
3			4		
4	24	0	11	Stiff tan CLAY, dry.	
			11		
			9	Stiff sandy CLAY, dry.	
5			16		
6	18	0	2	Stiff tan CLAY, trace silt, dry.	
			15	Stiff tan clayey SILT, dry.	
			13	Stiff red brown silty SAND, dry.	
7			14		
8	24	0	30	Very stiff green SAND, trace silt, wet.	
			27		
			14	Very stiff SAND, some/little clay, some gravel, wet.	
9			14		
10	16	5	12	Stiff tan silty CLAY, dry.	
			12		
			17	Stiff green SAND, trace silt, dry.	
11			20		
12	24	19	12		
			21		11-13' bgs.
			28	Very stiff tan sandy SILT, some clay, dry.	VOCs
13			30		
14	8	0	11	Very stiff reddish tan CLAY, dry.	
			19	Very stiff sandy SILT, some clay, dry.	
			21		
15			38		
16	18	20	8	Stiff tan silty CLAY, dry.	
			13		
			17	Stiff sandy CLAY and SILT, some limestone rock fragments, dry.	
17			18		
18	20	0	38		
			30		
			35	Hard red/brown silty SAND, trace clay, dry.	
19			40		
20	18	0	13		
			15		
			18	Stiff red/brown silty SAND, trace clay, dry.	
21			15		
22	6	0	16		
			22		
			34	Very stiff sandy CLAY, some silt, little/trace fine sand, dry.	
23			25		
24	24	0	13		
			17		
			19	Stiff sandy CLAY, some silt, little/trace fine sand, dry.	
25			21		
26	24	0	30	Stiff tan CLAY, some/little silt and sand, dry.	
			40	Stiff grey/tan coarse SAND and GRAVEL, dry.	25-27' bgs.
	24	0	55	Stiff sandy CLAY, some silt, little/trace fine sand, dry.	VOCs
27			47	End of boring @ 27' bgs.	

303768

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-2
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 12/3/97	TOTAL DEPTH OF BOREHOLE: 27 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: 24.0' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES	DEPTH (Feet)
0						0
1						1
				Drilled to 8' bgs. No split spoons collected.		
8						8
	24	0	13	Hard tan CLAY, trace silt, dry.		
9			35			9
			35			
10			23	Hard tan CLAY, some silt, some fine sand, dry.		10
	24	0	23			
11			23		10-12' bgs.	11
			28	Very stiff tan sandy CLAY, some silt, dry.	VOCs	
12			28			12
				Drilled from 12' to 21' bgs. No split spoons collected.		
21						21
	24	0	15	Very stiff tan CLAY, dry.		
22			26			22
			17	Very stiff tan sandy SILT, some CLAY, some gravel, dry.		
23			23			23
	24	0	15			
24			18		23-25' bgs.	24
			25	Very stiff tan silty fine SAND, some/little clay, dry.	VOCs	
25			31			25
	24	0	10	Hard tan SAND and GRAVEL, wet.		
26			27	Hard tan silty fine SAND, some clay, and some gravel, wet.		26
			33	V ery stiff tan silty fine SAND, some/little clay, dry.		
27			37	End of boring @ 27' bgs.		27

303769

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-3
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 12/3/97	TOTAL DEPTH OF BOREHOLE: 26 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: 25' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0					
1					
				Drilled to 6' bgs. No split spoons collected.	
6					
	24	0	7	Stiff tan CLAY, little sand, trace silt, dry.	
7			9	Stiff tan CLAY and GRAVEL, little sand, trace silt, dry.	
			12	Stiff Tan CLAY, some gravel, dry.	
8			17		
	24	0	7		
9			9		8-10' bgs.
			14	Stiff tan CLAY, trace sand/gravel, dry.	VOCs
10			18		
	20	0	20		
11			24		
			27	Very stiff tan CLAY, some sand, trace gravel, dry.	
12			21		
				Drilled from 12' to 18' bgs. No split spoons collected.	
18					
	24	0	15	Very stiff tan/brown CLAY, trace coarse sand, dry.	
19			24		
			27	Very stiff red/brown CLAY, trace silt and gravel, dry.	
20			23	Very stiff red/brown CLAY, trace sand, dry.	
	24	0	15	Stiff tan sandy SILT, some clay, dry.	
21			13		
			17	Stiff green CLAY, trace organic material, dry.	
22			19		
	12	0	14	Very stiff red/brown sandy SILT, some clay, dry.	
23			23		
			25		
24			27	Stiff reddish sandy SILT, some clay, trace gravel, dry.	
	12	0	12	Hard tan CLAY, some/little silt, dry.	
25			23	Hard tan silty SAND, wet.	24-26' bgs.
			59		VOCs
26			39	End of boring at 26' bgs.	

303770

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-4
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 12/3/97	TOTAL DEPTH OF BOREHOLE: 23 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: 22' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES	DEPTH (Feet)
0						0
1						1
				Drilled to 6' bgs. No split spoons collected.		
6						6
	18	0	5	Stiff grey CLAY, dry.		
7			5			7
			16	Stiff grey CLAY, trace silt, dry.		
8			21			8
	24	0	8	Stiff tan CLAY, dry.		
9			9	Stiff red/brown CLAY, dry.	8-10' bgs.	9
			12	Stiff red/brown CLAY, trace gravel, dry.	VOCs	
10			19			10
	24	0	8	Stiff grey CLAY, trace silt, dry.		
11			18	Stiff red/brown CLAY, trace silt, dry.		11
			19	Stiff red CLAY, trace gravel, dry.		
12			26			12
				Drilled from 12' to 21' bgs. No split spoons collected.		
21						21
	24	0	23	Hard tan CLAY, trace silt, dry.		
22			30		21-23' bgs.	22
			30	Hard red/brown coarse/medium SAND and GRAVEL, wet.	VOCs	
23			40	End of boring @ 23' bgs.		23

303771

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-5
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 12/10/97	TOTAL DEPTH OF BOREHOLE: 26 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	SEE FIGURE 3-2
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER 24' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0					
1					
6				Drilled to 6' bgs. No split spoons collected.	
7	16	0	13 11	Stiff brown medium SAND and GRAVEL, some silt, wet.	
8			12 13	Stiff tan CLAY, trace sandand gravel, dry.	
9	16	0	11 11	Stiff tan silty fine/medium SAND, dry. Stiff tan coarse SAND and GRAVEL, moist.	
10			17 19	Stiff tan/brown CLAY, little sand, dry.	
11	24	0	17 15	Stiff red/brown CLAY, trace sand, dry.	
12			20 21	Stiff tan CLAY, some sand, dry.	
13	16	0	14 29		
14			27 26	Very stiff tan CLAY, little/trace sand, dry.	
15	24	0	12 21	Very stiff sandy CLAY, some silt, dry.	
16			23 23	Very stiff tan CLAY, some sand, dry.	
17	16	0	24 22		
18			24 50	Very stiff brown sandy CLAY, trace gravel.	
19	24	0	19 28	Very stiff tan SAND, some gravel, trace silt	18-20' bgs.
20			28 16	and clay, moist.	VOCs
21	8	0	8 17		
22			30 30	Very stiff tan CLAY, some sand, dry.	
23	15	0	36 40	Hard brown sandy CLAY, trace gravel, moist.	22-24' bgs.
24			35 50	Hard orange/brown sandy CLAY, dry.	VOCs
25	12	0	12 22		
26			17 20	Hard tan/brown SAND and GRAVEL, trace silt, wet. End of boring @ 26' bgs.	

303772

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-6
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 12/10/97	TOTAL DEPTH OF BOREHOLE: 30 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	SEE FIGURE 3-2
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0					
1					
				Drill to 6' bgs. No split spoons collected.	
6					
	6	0	14	Stiff brown SAND, some silt and clay, dry.	
7			21	Stiff brown sandy CLAY, little silt, dry.	
			16		
8			19		
	24	0	9	Stiff brown CLAY, trace sand, moist.	
9			8		
			12	Stiff brown SAND, some clay, dry.	
10			13		
	24	0	8	Stiff tan CLAY, trace sand, dry.	
11			10	Stiff tan SAND, some clay, dry.	
			12	Stiff tan CLAY, dry.	
12			16	Stiff tan medium-coarse SAND, dry.	
	22	0	5	Stiff tan fine SAND, trace silt, dry.	
13			8	Stiff tan CLAY, some sand, dry.	
			14	Stiff tan clayey SAND, dry.	
14			14	Stiff tan CLAY, dry.	
	20	0	8		
15			17		
			19	Stiff tan fine/medium SAND, trace gravel, dry.	
16			13		
	16	0	35		
17			31		
			35	Hard tan fine/medium coarse SAND, trace gravel, dry.	
18			31		
	18	0	15	Very stiff tan fine SAND and GRAVEL, trace silt, dry.	
19			24		
			20		
20			30	V ery stiff red/brown CLAY, little/trace sand, dry.	
	20	0	16		
21			31		
			20	Very stiff brown CLAY, some sand, trace gravel, dry.	
22			29		
	24	0	22		
23			48		
			46	Hard brown CLAY, trace sand, dry.	
24			39		
	24	0	12		
25			15		
			19	Stiff red/brown CLAY, some/little sand, dry.	
26			18		
	24	0	21	Stiff tan CLAY, trace sand, dry.	
27			30		
			30	Hard tan sand, dry.	
28			50	Soft tan clayey SAND, dry.	
	20	0	34	Hard brown clayey SAND and GRAVEL, dry.	
29			38		* Select VOCs 28-30' bgs.
			30	Hard brown fine SAND, dry.	
30			31	End of boring @ 30' bgs.	

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303773

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-7
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 3/27/98	TOTAL DEPTH OF BOREHOLE: 31 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER: 24' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	3.5	0		
		0	Brown CLAY, some silt, trace sand, dry.	
1		0		
		0		
2		0	Brownish SILT with clay, dry.	
		0		
3		0		
		0		
4		0		
	4.0	0	Brown SILT with sand, trace clay, dry.	
5		0		* Select VOCs 4-6' bgs.
		0	Brown CLAY, trace silt, dry.	
6		0	Brown SAND, some silt, trace clay, dry.	
		0		
7		0		
		0		
8		0	Light brown CLAY, some gravel, little sand, dry.	
	3.8	0		
9		0		
		0		
10		0		
		0	Light brown CLAY, trace silt, dry.	
11		0		
		0		
12		0		
	3.0	0		
13		0	Brown SILT, some clay, trace silt, dry.	* Select VOCs 12-13' bgs.
		0		
14		0		
		0		
15		0		
	2.0	0		
16		0		* Select VOCs 15-17' bgs.
		0		
17		0		
	3.0	0		
18		0		
		0		
19		0	Brown CLAY, trace silt, dry.	
		0		
20		0		
	4.0	0		
21		0		* Select VOCs 20-22' bgs.
		0		
22		0		
		0		
23		0	Brown CLAY, some silt, trace sand, dry.	* Select VOCs 22-24' bgs.
		0		
24		0		

303774

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-7
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 3/27/98	TOTAL DEPTH OF BOREHOLE: 31 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	SEE FIGURE 3-2
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER 24' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
	3.0	0	Brown SILT, trace sand, wet.	
25		0		* Select VOCs 24-26' bgs.
		0		
26		0	Brown SAND, trace silt, wet.	
		0		
27		0		
		0	Brown SAND and SILT with medium gravel, wet.	
28		0		
		0	SAND with gravel, trace silt, wet.	
29		0		
		0		
30		0		
		0		
31		0	End of boring @ 31.0' bgs.	

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303775

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-8
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 3/27/98	TOTAL DEPTH OF BOREHOLE: 30 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	SEE FIGURE 3-2
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER 22' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	4.0	0		
		0	Brown SAND, some gravel, dry.	
1		0	Brown SILT and CLAY, dry.	
		0		
2		0	Brown SILT, trace sand, dry.	
		0		
3		0	Brown CLAY, some silt, trace sand, dry.	
		0		
4		0		
	4.0	0		
5		0	Brownish/red SILT and SAND, trace clay, dry.	* Select VOCs 4-6' bgs.
		0		
6		0		
		0	Brownish SILT, little medium gravel, trace sand and clay, dry.	
7		0		
		0		
8		0		
	4.0	0	Brown CLAY, trace silt, dry.	
9		0		
		0		
10		0		
		0		
11		0		* Select VOCs 10-12' bgs.
		0	Brown SILT, some coarse sand, trace clay, dry.	
12		0		
	4.0	0	Brown CLAY, trace silt, dry.	
13		0	Light brown SAND, some silt, trace clay, dry.	
		0		
14		0		
		0	Light brown SILT, some sand and medium gravel, dry.	
15		0		
		0	Light brown CLAY, trace sand, dry.	
16		0		
	3.0	0	Light brown CLAY, trace silt, dry.	
17		0		* Select VOCs 16-18' bgs.
		0		
18		0	Light brown SILT, trace clay, dry.	
		0		
19		0		
	3.0	0	Light brown CLAY, some silt, dry.	
20		0		
		0	Light brown CLAY, some silt, trace sand, dry.	
21		0		* Select VOCs 20-22' bgs.
		0		
22		0		
	4.0	0	Brown SILT, some clay, trace sand, moist.	
23		0		* Select VOCs 22-24' bgs.
		0		
24		0		
		0	Brown SILT and SAND, some gravel, trace clay, wet.	
25		0		
		0		
26		0		

303776

SOIL BORING LOG

McLaren Hart	PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBPP-8
	PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH
COMPLETION DATE: 3/27/98	TOTAL DEPTH OF BOREHOLE: 30 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	SEE FIGURE 3-2
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER 22' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
	4.0	0		
27		0		27
		0	Brown CLAY, some gravel and silt, trace sand, wet.	
28		0		28
		0		
29		0		29
		0		
30		0	End of boring @ 30.0' bgs.	30

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303777

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-9
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 3/29/98	TOTAL DEPTH OF BOREHOLE: Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0				
	3.5	0		
1		0		
		0		
2		0		
		0		
3		0		
		0	Brown sandy CLAY, some silt, dry.	
4		0		
	3.0	0	Brown CLAY, some sand, little silt, dry.	
5		0		* Select VOCs 4-6' bgs.
		0		
6		0		
		0		
7		0		
		0	Brown clayey SAND, some silt, dry.	
8		0		
	3.0	0	Brown CLAY, some silt, dry.	
9		0		
		0		
10		0	Brown SAND, some clay, little silt, dry.	
		0		
11		0		* Select VOCs 10-12' bgs.
	3.0	0	Brown clayey SAND, some silt, dry.	
12		0		
		0		
13		0		
		0	Light brown SAND, little silt, dry.	
14		0		
	3.0	0		
15		0		
		0		
16		0		
		0		
17		0		* Select VOCs 16-18' bgs.
	2.0	0		
18		0		
		0		
19		0		
	3.5	0		
20		0		
		0		
21		0		* Select VOCs 20-22' bgs.
		0	Light brown mottled grey SAND and CLAY, some silt, dry.	
22		0		
		0		
23	2.5	0	Light brown CLAY, some silt, moist.	* Select VOCs 22-24' bgs.
		0		
24		0		
		0	Light brown clayey SAND, some silt, wet.	
25		0	End of boring @ 25.0' bgs.	

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303778

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-10
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 3/30/98	TOTAL DEPTH OF BOREHOLE: 32 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER: 22.5' bgs.	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0				
	4.0	0	Concrete.	
1		0	Light brown CLAY, some fine-medium sand, some silt, dry.	
		0		
2		0		
		0		
3		0		
		0		
4		0		
	4.0	0		
5		0	Light brown medium SAND, some gravel, dry.	* Select VOCs 4-6' bgs.
		0		
6		0		
		0	Light brown CLAY, some medium sand, little gravel, dry.	
7		0		
		0		
8		0	Light brown medium SAND, some gravel, dry.	
	4.0	0		
9		0		
		0		
10		0		
		0		
11		0		* Select VOCs 10-12' bgs.
		0	Light brown medium SAND, some fine gravel, trace silt, dry.	
12		0		
	3.0	0	Light brown fine-medium SAND, little gravel, dry.	
13		0		
		0		
14		0	Brown fine SAND, trace silt and fine gravel, dry.	
		0		
15		0		
	3.7	0		
16		0		
		0		
17		0		* Select VOCs 16-18' bgs.
		0	Brown SILT, little fine-medium gravel, trace sand, dry.	
18		0		
		0		
19		0		
	2.0	0		
20		0	Light brown/gray CLAY, some silt, trace sand, sporadic	
		0	fine-medium gravel, dry.	
21		0		* Select VOCs 20-22' bgs.
	3.0	0		
22		0		
		0		
23		0		* Select VOCs 22-24' bgs.
		0		
24		0		

303779

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-10
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 3/30/98	TOTAL DEPTH OF BOREHOLE: 32 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER: 22.5' bgs.	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
25	3.0	0		* Select VOCs 24-26' bgs.
		0		
26		0	Brown CLAY, little very fine gravel, trace silt, dry.	
		0		* Select VOCs 26-28' bgs.
27		0		
28	2.0	0	Dark brown SAND, some clay, little silt, medium gravel, dry.	
		0	Dark brown CLAY, some medium sand, dry.	
29		0		* Select VOCs 28-30' bgs.
30	2.0	0		
		0	Dark brown SAND, some coarse gravel, little silt, trace clay, dry.	
31		0		* Select VOCs 30-32' bgs.
32	1.0	0	End of boring @ 32.0' bgs.	

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303780

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-13
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 3/31/98	TOTAL DEPTH OF BOREHOLE: 30.6 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER: 22.65' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	3.5	0	Brown CLAY, some sand, dry.	
1		0		
		0		
2		0		
		0		
3		0		
		0		
4		0		
	4.0	0		
5		0		* Select VOCs 4-6' bgs.
		0		
6		0		
		0		
7		0		
		0	Brown CLAY, some medium gravel, little sand, dry.	
8		0		
	1.0	0		
9		0		
	3.0	0	Light brown sandy CLAY with medium gravel, little silt, dry.	
10		0		
		0		
11		0		* Select VOCs 10-12' bgs.
		0	Light brown CLAY some sand and silt, little fine gravel, dry.	
12		0		
	2.0	0		
13		0		
		0	Dark brown sandy CLAY, little medium gravel and silt, dry.	
14		0		
	2.0	0		
15		0		
		0	Brown sandy SILT, some clay, little fine/medium gravel, dry.	
16		0		
	3.0	0		
17		0		* Select VOCs 16-18' bgs.
		0		
18		0		
		0		
19		0		
	3.0	0		
20		0		
		0	Light brown CLAY, some sand, little medium gravel, dry.	
21		0		* Select VOCs 20-22' bgs.
		0		
22		0		
	3.0	0		
23		0		* Select VOCs 22-24' bgs.
		0		
24		0		
		0		
25		0		* Select VOCs 24-26' bgs.

303781

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-13
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 3/31/98	TOTAL DEPTH OF BOREHOLE: 30.6 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	SEE FIGURE 3-2
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER 22.65' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

26	2.0	0 0 0 0	Light brown CLAY, some silt, little sand, dry.	26
27				27
28	2.0	0 0 0 0	Brown CLAY and SAND, some silt, little fine-medium gravel, dry.	* Select VOCs 26-28' bgs. 28
29				29
30	2.0	0 0 0 0	Brown CLAY and SAND, some silt, little fine-medium gravel, wet.	* Select VOCs 28-30' bgs. 30
31			End of boring @ 31.0' bgs.	31

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303782

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-15
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 4/2/98	TOTAL DEPTH OF BOREHOLE: 11 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER: 8.0' bgs.	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	4.0	0	Dark brown CLAY, some sand, dry.	
		0		
1		0	Brown CLAY, trace sand, dry.	
		0		
2		0		
		0		
3		0		
		0		
4		0		
	4.0	0		
5		0		
		0		
6		0	Dark brown SILT, some coarse sand, trace clay, dry.	
		0	Dark blue/black SAND, trace gravel, dry.	* Select VOCs 5-7' bgs.
7		0		
		0	Dark blue/black CLAY, some sand and gravel, moist.	
8		0		
	3.0	0	Dark blue/black CLAY, some sand and gravel, wet.	
9		0		
		0	Dark blue/black CLAY, trace sand, wet.	
10		0		
		0		
11		0	End of boring @ 11.0' bgs.	
				* Select VOCs 10-12' bgs.
12				

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303783

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-22
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 4/3/98	TOTAL DEPTH OF BOREHOLE: 14 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	SEE FIGURE 3-2
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER 8' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0				
	4.0	0	Light brown SILT, trace clay, dry.	
1		0		
		0		
2		0		
		2.3	Brown SAND, some silt and clay, dry.	* Select VOCs 1-3' bgs.
3		0		
		0		
4		0	Brown CLAY, trace silt, dry.	
	3.5	0	Light brown CLAY, trace silt and sand, dry.	* Select VOCs 3-5' bgs.
5		0		
		7.5		
6		3.0	Dark brown clayey SAND with black streaks, dry.	
		1.3		* Select VOCs 5-7' bgs.
7		0		
		0		
8	3.0	0	Dark brown CLAY, some silt, wet.	
		0		
9		0		* Select VOCs 7.5-9.5' bgs.
		0	Brown CLAY, some silt and sand, wet.	
10		0		
		0	Light brown SAND, some silt, trace clay.	
11	2.0	0		
		0		* Select VOCs 10-12' bgs.
12		0	Brown fine/medium SAND, trace silt, dry.	
	2.0	0		
13		0		* Select VOCs 12-14' bgs.
		0		
14		0	End of boring at 14' bgs.	

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303784

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-23
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 4/4/98	TOTAL DEPTH OF BOREHOLE: 30 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER: 20.30' bgs.	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0				
	3.0	0	Brown medium SAND, trace silt, dry.	
1		0		
		0		
2		0	Brown CLAY, trace sand, dry.	
		0		
3		0		
		0		
4		0		
	3.0	0	Brown CLAY, some fine sand, little silt, dry.	
5		0		
		0		
6		0		
		0	Brown clayey SAND, some silt, dry.	
7		0		
	3.0	0		* Select VOCs 6-8' bgs.
8		0		
		0		
9		0		
		0	Brown sandy CLAY, some silt, dry.	* Select VOCs 8-10' bgs.
10		0		
	2.0	0	Brown SILT and SAND, trace clay, dry.	
11		0		
		0	Brown CLAY, trace sand, dry.	* Select VOCs 10-12' bgs.
12		0	Brown SILT and SAND, trace clay, dry.	
	2.0	0		
13		0		
		0	Brown sandy CLAY, some fine gravel, little, silt, dry.	
14		0		
	2.0	0		
15		0		
		0		
16		0		
	3.0	0		
17		0		
		0		* Select VOCs 16-18' bgs.
18		0		
		0	Brown SAND, trace silt and gravel, dry.	
19		0		
	3.0	0		
20		0		
		0		
21		0		* Select VOCs 20-22' bgs.
		0	Brown SAND, some medium gravel, little silt, dry.	
22		0		
	4.0	0		
23		0		* Select VOCs 22-24' bgs.
		0	Brown CLAY, some sand, little silt, dry.	
24		0		
		0		
25		0		* Select VOCs 24-26' bgs.
		0	Brown CLAY, some sand, little silt, wet.	
26		0		

303785

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-23
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 4/4/98	TOTAL DEPTH OF BOREHOLE: 30 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac.	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER: 20.30' bgs.	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
	4.0	0	Brown sandy CLAY, some silt, wet.	
27		0		
		0		* Select VOCs 26-28' bgs.
28		0		
		0		
29		0		
		0		* Select VOCs 28-30' bgs.
30		0	End of boring at 30' bgs.	

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303786

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-26
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 4/5/98	TOTAL DEPTH OF BOREHOLE: 12 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER: NA	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0				
	1.5	0		
1		0		
		0		
2		0		
		0		
3		0		
		0		
4		0	Light brown CLAY, trace sand and gravel, dry.	
	2.0	0		
5		0		
		0		
6		0		
		0	*Light brown CLAY, some gravel, trace sand, dry.*	
7		0	Grayish blue SAND, trace gravel, dry.	* Select VOCs 6-8' bgs.
		0	Light brown CLAY, dry.	
8		0	Brown CLAY, some sand, trace silt, dry.	
	4.0	0		
9		0		* Select VOCs 8-10' bgs.
		0		
10		0		
		0		
11		0	Brown CLAY, some sand, little silt, trace gravel, dry.	* Select VOCs 10-12' bgs.
		0		
12		0	End of boring at 12' bgs.	

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303787

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-27
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 4/5/98	TOTAL DEPTH OF BOREHOLE: 25 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	SEE FIGURE 3-2
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER 22 Feet	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0				
	2.5	0		
1		0		
		0	Light brown SAND, some gravel, little clay, dry.	
2		0		
		0	Light brown CLAY, trace sand, little silt, dry.	
3		0		
		0		
4		0		
	4.0	0		
5		0		* Select VOCs 4-6' bgs.
		0		
6		0		
		0		
7		0	Light Brown SAND, some clay, little medium gravel, dry.	
		0		
8		0	Light brown CLAY, some sand, little gravel, hard, dry.	
	2.5	0		
9		0		
		0		
10		0		
		0	Light brown CLAY, little sand, trace gravel, hard, dry.	
11	1.5	0		* Select VOCs 10-12' bgs.
		0		
12		0		
		0		
13		0	Brown CLAY, little sand ,trace gravel, dry.	
	4.0	0		
14		0		
		0		
15		0		
		0		
16		0		
		0		
17		0	Brown CLAY, little sand ,trace gravel, dry.	* Select VOCs 16-18' bgs.
	2.0	0		
18		0		
		0		
19		0	Brown SAND, some clay, little medium gravel, dry.	
	3.0	0		
20		0		
		0		
21		0	Brown CLAY, some sand ,trace gravel, dry.	
		0		
22		0	Brown coarse SAND, some clay, wet.	
	3.0	0		
23		0		* Select VOCs 22-24' bgs.
		0		
24		0	Brown coarse SAND, some clay, little gravel, wet.	

303788

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBPP-27
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE: Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	SEE FIGURE 3-2
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER Feet	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: **PROCESS PIT**			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES	DEPTH (Feet)
		0			
25		0	Brown CLAY, some silt, trace gravel, wet.		25
26					26
27					27
28					28
29					29
30					30
31			End of boring at 31' bgs.		31

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303789

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBPP-32
PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH: SEE FIGURE 3-2

COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE:	MONITORING DEVICE:	GEOLOGIST / OFFICE:
4/7/98	27 Feet	OVM (PID)	Anuj Gulati/Warren

DRILLING CONTRACTOR / DRILLER:	DRILLING EQUIPMENT:	DRILLING METHOD / BIT:
TerraVac	Geoprobe	Geoprobe

SAMPLING METHOD:	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION:	WELL INSTALLED?
Macrocore	20.9 Feet	NA	Temporary Well

MEMO: **PROCESS PIT**

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	4.0	0		
		0		
1		0		
		0	Brown CLAY, some silt, dry.	
2		0		
		0	Brown coarse SAND, some medium gravel, dry.	
3		0		
		0		
4		0	Brown CLAY, some silt, trace gravel, dry.	
	4.0	0		
5		0		* Select VOCs 4-6' bgs.
		0		
6		0		
		0		
7		0		
		0		
8		0	Brown CLAY, some silt, trace gravel, dry.	
	2.0	0		
9		0	Brown CLAY, some silt, trace gravel, dry.	
		0	Brown CLAY, some medium gravel, dry.	
10		0		
	3.0	0		
11		0		* Select VOCs 10-12' bgs.
		0		
12		0		
		0		
13		0	Brown CLAY, little sand, trace gravel, dry.	
	2.0	0		
14		0		
		0		
15		0	Brown CLAY, little silt, trace fine sand, dry.	
	2.0	0		
16		0		
		0		
17		0	Brown CLAY, some silt, trace fine sand, dry.	* Select VOCs 16-18' bgs.
	3.0	0		
18		0		
		0		
19		0		
		0		
20		0	Brown CLAY, some silt, trace fine sand, dry.	
	3.0	0		
21		0		
		0		
22		0		
		0		
23		0	Brown CLAY, some coarse sand , little silt, dry.	
	4.0	0		
24		0		

303790

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBPP-32
PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH
COMPLETION DATE: 4/7/98	TOTAL DEPTH OF BOREHOLE: 27.3 Feet	MONITORING DEVICE: OVM (PID)
GEOLOGIST / OFFICE: Anuj Gulati/Warren		SEE FIGURE 3-2
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER 20.9 Feet	GROUND SURFACE ELEVATION: NA
WELL INSTALLED? Temporary Well		
MEMO: **PROCESS PIT**		

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES	DEPTH (Feet)
25		0 0 0		* Select VOCs 24-26' bgs.	25
26		0 0	Light brown CLAY, some sand, little silt, wet.		26
27		0			27
28	1.0	0 0	Light brown CLAY, some sand, little silt, wet.	* Select VOCs 27-28' bgs.	28
29					29
30					30
31			End of boring at 31' bgs.		31

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303791

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: SBOR-1
PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH: SEE FIGURE 3-2

COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE:	MONITORING DEVICE:	GEOLOGIST / OFFICE:
4/1/98	27 Feet	OVM (PID)	Anuj Gulati/Warren

DRILLING CONTRACTOR / DRILLER:	DRILLING EQUIPMENT:	DRILLING METHOD / BIT:
TerraVac	Geoprobe	Geoprobe

SAMPLING METHOD:	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION:	WELL INSTALLED?
Macrocore	22.0' bgs.	NA	Temporary Well

MEMO: **PROCESS PIT**

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0				
	4.0	0	Light gray SAND, some clay, little medium gravel, dry.	
1		0		
		0		
2		0	Bluish gray (stained) SAND, some clay, little medium gravel, dry.	
		2		
3		6		* Select VOCs 2-4' bgs.
		4		
4		5		
	4.0	0		
5		6		* Select VOCs 4-6' bgs.
		0		
6		0		
		0		
7		0		
		0	Brown gravelly SAND, some clay, dry.	
8		0		
	2.5	0		
9		0		
		0		
10		0		
		0	Light brown coarse SAND, some fine gravel, dry.	
11		0		* Select VOCs 10-12' bgs.
	3.0	0		
12		0		
		0		
13		0		
		0		
14		0		
	2.5	4		
15		0		* Select VOCs 14-16' bgs.
		0		
16		0		
		0	Brown SAND, some medium gravel, dry.	
17		0		
	2.0	0		
18		0		
		0		
19		0		
	2.5	0		
20		0		
		0		
21		0		* Select VOCs 20-22' bgs.
		0	Brown clayey SAND with medium gravel, some silt, dry.	
22		0		
	3.0	0		
23		0		* Select VOCs 22-24' bgs.
		0		
24		0		
		0		
25		0		* Select VOCs 24-26' bgs.

303792

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBOR-1
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 4/1/98	TOTAL DEPTH OF BOREHOLE: 27 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: Anuj Gulati/Warren
DRILLING CONTRACTOR / DRILLER: TerraVac	DRILLING EQUIPMENT: Geoprobe	DRILLING METHOD / BIT: Geoprobe	SEE FIGURE 3-2
SAMPLING METHOD: Macrocore	DEPTH TO GROUNDWATER 22.0' bgs.	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? Temporary Well
MEMO: PROCESS PIT			

DEPTH (Feet)	RECOVERY (ft)	OVM (PPM)	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES	
26	1.0	1.7 1.1	Hard brown CLAY, some silt, dry.		26
27	1.0	0 0 0	Brown SAND, some clay, little medium gravel, moist.	* Select VOCs 26-28' bgs.	27
28		0	End of boring at 28' bgs.		28

* Select VOCs: toluene, ehtylbenzene, xylene, chloroform, acetone, methyl chloride

303793

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: GWPP-27A
PROJECT LOCATION: St. Croix U.S. Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 10/13/98	TOTAL DEPTH OF BOREHOLE: 119 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: N.Eichlin/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Mud Rotary	SEE FIGURE 3-4
SAMPLING METHOD: Hydropunch	DEPTH TO GROUNDWATER ~ 21'	GROUND SURFACE ELEVATION: 29.34' msl	WELL INSTALLED? No
MEMO: **Process Pit Area**			

DEPTH (Feet)	RECOVERY (Feet)	OVM (PPM)	BURMEISTER SYSTEM SOIL DESCRIPTION Color, Texture, Moisture, Etc.	GROUND WATER SAMPLES
0				
1				
			Drilled to 82' bgs.	
82				
83	1.5		SAND, some clay and little silt. Stiff CLAY, little sand. SAND, some clay and little silt.	
84				
85				84-87' bgs. VOCs
86				
87				
88			Drilled from 84' - 88' bgs.	
89	2		White stiff CLAY, some sand and silt, dry. White stiff CLAY, some sand, little silt, dry. Tan SAND, some clay and silt, dry.	
90				
91				
92				
93				
94				
95				
96				95-99' bgs. VOCs
97				
98				
99				
100			Drilled from 90' - 100' bgs.	
101	2		White CLAY, some sand and silt, trace limestone gravel, moist.	
102				
103				
104				

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: GWPP-27A
PROJECT LOCATION: St. Croix U.S. Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 10/13/98	TOTAL DEPTH OF BOREHOLE: 119 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: N.Eichlin/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Mud Rotary	SEE FIGURE 3-4
SAMPLING METHOD: Hydropunch	DEPTH TO GROUNDWATER ~ 21'	GROUND SURFACE ELEVATION: 29.34' msl	WELL INSTALLED? No
MEMO: **Process Pit Area**			

DEPTH (Feet)	RECOVERY (Feet)	OVM (PPM)	BURMEISTER SYSTEM SOIL DESCRIPTION Color, Texture, Moisture, Etc.	GROUND WATER SAMPLES
105				
106				
107				
108				
109				
110			Drilled from 100' - 110' bgs.	
111	1.5		White CLAY, some sand and silt, weathered rock, moist	
112				
113				
115			Drilled from 112' - 115 bgs.	110-120' bgs. VOCs
116	2		Light gray/brown CLAY, little silt, moist.	
117				
118				
119			Drilled from 117' - 119' bgs. End of boring at 119' bgs.	

303795

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: GWPP-36
PROJECT LOCATION: St. Croix U.S. Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 10/16/98	TOTAL DEPTH OF BOREHOLE: 107 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: N.Eichlin/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Mud Rotary	SEE FIGURE 3-4
SAMPLING METHOD: Hydropunch	DEPTH TO GROUNDWATER 21.3'	GROUND SURFACE ELEVATION: 28.06' msl	WELL INSTALLED? No
MEMO: **Former Drum Area**			

DEPTH (Feet)	RECOVERY (Feet)	OVM (PPM)	BURMEISTER SYSTEM SOIL DESCRIPTION Color, Texture, Moisture, Etc.	SAMPLES
0				
1				
18			Drilled to 18' bgs.	
19	1.5		Brown medium SAND, some silt, trace gravel, wet.	
20				
21				
22				20-24' bgs VOCs
23				
24				
25				
26				
27				
28				
29				
30			Drilled from 20' - 30' bgs.	
31	1.5		Medium brown SAND, some clay, little gravel, dry.	
32				
33				
34				
35			Drilled from 32' - 35' bgs.	
36	1.5		Medium brown and gray CLAY, little silt and coarse sand, dry.	
37				
38				
39				

303796

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001	Boring No: GWPP-36
PROJECT LOCATION: St. Croix U.S. Virgin Islands		LOCATION SKETCH: SEE FIGURE 3-4

COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE:	MONITORING DEVICE:	GEOLOGIST / OFFICE:
10/16/98	107 Feet	OVM (PID)	N.Eichlin/Warren

DRILLING CONTRACTOR / DRILLER:	DRILLING EQUIPMENT:	DRILLING METHOD / BIT:
CT&E	B-80	Mud Rotary

SAMPLING METHOD:	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION:	WELL INSTALLED?
Hydropunch	21.3'	28.06' msl	No

MEMO: **Former Drum Area**

DEPTH (Feet)	RECOVERY (Feet)	OVM (PPM)	BURMEISTER SYSTEM SOIL DESCRIPTION Color, Texture, Moisture, Etc.	SAMPLES
40			Drilled from 37' - 40' bgs.	
41	1.5		Medium brown SILT, some clay, little sand, dry.	
42				
43				
44				
45			Drilled from 42' - 45' bgs.	
46	2		Brown CLAY, some silt and sand, dry.	
47				
48				
49				
50				
51				
52				50-54' bgs. VOCs
53				
54				
55				
56				
57				
58				
59				
60			Drilled from 47' - 60' bgs.	
61	1		Medium brown CLAY, some sand and brown to black gravel, dry.	
62				
63				
64				
65				

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: GWPP-36
PROJECT LOCATION: St. Croix U.S. Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 10/16/98	TOTAL DEPTH OF BOREHOLE: 107 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: N.Eichlin/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Mud Rotary	SEE FIGURE 3-4
SAMPLING METHOD: Hydropunch	DEPTH TO GROUNDWATER 21.3'	GROUND SURFACE ELEVATION: 28.06' msl	WELL INSTALLED? No
MEMO: **Former Drum Area**			

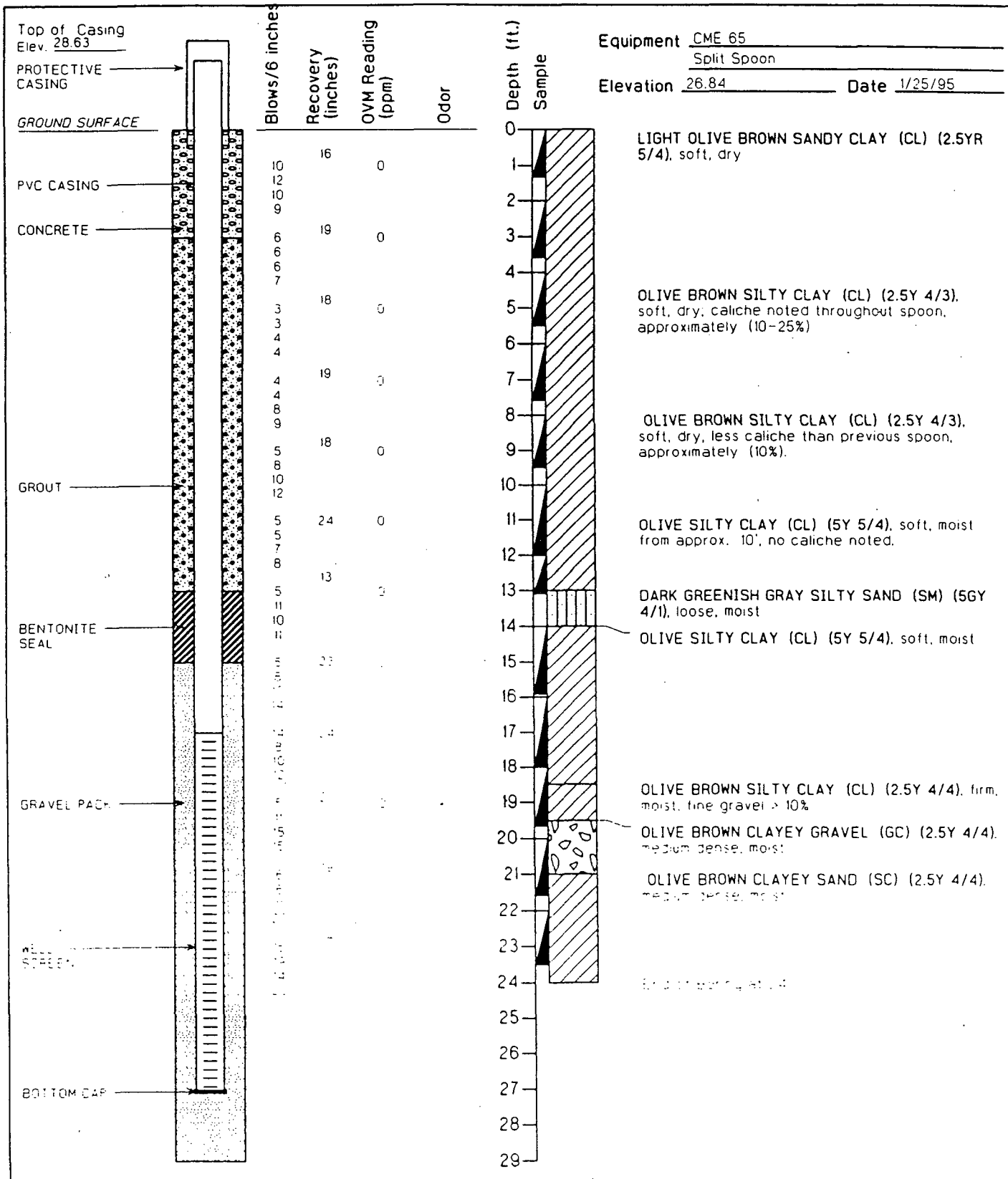
DEPTH (Feet)	RECOVERY (Feet)	OVM (PPM)	BURMEISTER SYSTEM SOIL DESCRIPTION Color, Texture, Moisture, Etc.	SAMPLES
66				
67				
68				
69				
70			Drilled from 62' - 70' bgs.	
71	1		Medium brown CLAY, some silt, dry.	
72			Medium brown GRAVEL and SAND, some clay, dry.	
73				
74				
75				
76				
77				75-79' bgs. VOCs
78				
79				
80			Drilled from 72' - 80' bgs.	
81	1		Light brown SAND, some gravel, little clay, slightly moist.	
82				
83				
84				82-85' bgs. VOCs
85				
86				
87				
88				
89				
90				
91				

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: GWPP-36
PROJECT LOCATION: St. Croix U.S. Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 10/16/98	TOTAL DEPTH OF BOREHOLE: 107 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: N.Eichlin/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Mud Rotary	SEE FIGURE 3-4
SAMPLING METHOD: Hydropunch	DEPTH TO GROUNDWATER 21.3'	GROUND SURFACE ELEVATION: 28.06' msl	WELL INSTALLED? No
MEMO: **Former Drum Area**			

DEPTH (Feet)	RECOVERY (Feet)	OVM (PPM)	BURMEISTER SYSTEM SOIL DESCRIPTION Color, Texture, Moisture, Etc.	SAMPLES
92				
93				
94				
95				
96				
97				
98				
99				
100			Drilled from 82' - 100' bgs.	
101	1		Light brown CLAY, some small pieces of white rock, little silt, dry.	97-107' bgs. VOCs
102				
103				
104				
105				
106				
107			Drilled from 102' - 107' bgs. End of boring at 107' bgs.	



FIGURE

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215-627-4505

Log of Boring and Well Completion SB-D1 / MW-4
ICC
St. Croix, U.S. Virgin Islands

303800

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JSW	29872.06.1		4/28/95	

Equipment CME 65
Split Spoon
Elevation Not Measured Date 1/19/95

Blows/6 inches	Recovery (inches)	OVM Reading (ppm)	Odor	Depth (ft.)	Sample	
5 5 5 5	15	0		0–1		DARK GRAYISH BROWN SILTY CLAY (CL) (10YR 4/2), soft, moist, dark red mottling
3 4 6 6	22	0		1–4		
3 5 7 9	17	0		4–6		OLIVE GRAY SILTY CLAY (CL) (5Y 4/2), firm, moist
7 8 9 7	14	0		6–8		PALE OLIVE CLAYEY SAND (SC) (5Y 6/3), loose, moist
6 10 12 13		0		8–9		GREENISH GRAY CLAY (CH) (5BG 4/1), firm, moist
				9–15		OLIVE CLAYEY SAND (SC) (5Y 5/3), medium dense, moist
10 12 13	22	0		15–17		GRAYISH GREEN SANDY CLAY (CL) (5G 5/2), firm, moist, caliche visible from approx 15.5–16.0, brown mottling
				17–22		GREENISH GRAY SILTY SAND (SM) (5GY 5/1), loose, dry, wet at approx 21.5–22.0
				22–25		GREENISH GRAY SANDY SILT (ML) (5G 5/2), firm, moist, brown mottling
				25		End of Boring at 25'

FIGURE

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Log of Boring SB-D2
ICC
St. Croix, U.S. Virgin Islands

303801

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		4/27/95	

Equipment CME 65
Split Spoon
Elevation Not Measured Date 1/20/95

Depth (ft.) Sample	Blows/6 inches	Recovery (inches)	OVM Reading (ppm)	Odor
0–1	6 3 8 8		0	
2–4	8 7 6 8	21	0	
5–6	6 7 8 8	20	0	
7–8	8 18 24 23	20	0	
9–10	17 19 16 19	16	0	
15–16		22		
18–19		21		
20–21	12 13 13 11	15		

VERY DARK GRAY BROWN SILTY GRAVEL (GM) (2.5Y 3/2), loose, dry

VERY DARK GRAYISH BROWN SANDY SILT (ML) (2.5Y 3/2), soft, dry

DARK GRAYISH BROWN SANDY SILT (ML) (2.5Y 4/2), soft, dry, sand appears to be caliche, red brown mottling, noted beginning 4-6' interval.

WHITE SANDY SILT (ML) (5Y 8/1), soft, dry, appears to be caliche

GRAY GRAVEL (GP) (5Y 5/1), medium dense, dry, appears to be limestone.

OLIVE SILTY GRAVEL (GM) (5Y 4/3), medium dense, dry

OLIVE SANDY SILT (ML) (5Y 5/4), firm, dry

GRAYISH GREEN CLAY (CL) (5G 4/2), firm, moist, caliche at approx. 16.5'

DARK GREENISH GRAY SILTY SAND (SM) (5BG 4/1), medium dense, dry, wet at approximately 20-21'

End of Boring at 21'

FIGURE

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Log of Boring SB-D3
ICC
St. Croix, U.S. Virgin Islands 303802

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		4/28/95	

Equipment CME 65
Split Spoon
Elevation Not Measured Date 1/23/95

Depth (ft.)	Sample	Blows/6 inches	Recovery (inches)	OVM Reading (ppm)	Odor
0					
1		6 7 7 7	18	0	
2					
3		6 7 9 10	16	0	
4					
5		6 7 7 12	22	0	
6					
7		11 17 17 22	23	0	
8					
9		16 23 27 23	20	0	
10					
11		13 20 17 22	18	0	
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

LIGHT OLIVE BROWN SILTY GRAVEL (GM) (2.5Y 5/3), loose, dry

DARK GRAYISH BROWN SANDY SILT (ML) (2.5Y 4/2), soft, dry

OLIVE SILTY SAND (SM) (5Y 4/4), medium-dense, dry, fine to medium gravel and caliche noted from 6'-8'.

OLIVE YELLOW SANDY GRAVEL (GM) (5Y 6/6), medium dense, dry

OLIVE YELLOW SILTY SAND (SM) (2.5Y 6/6), medium dense, dry, caliche noted throughout spoon, FINE BLACK LIMESTONE GRAVEL (5Y 2.5/1) noted throughout spoon

LIGHT OLIVE BROWN SILTY CLAY (CL) (2.5Y 5/4), firm, damp, slightly plastic clay beginning approx. 15.5-16.0' below ground surface, [illegible] gray mottling (5G 5/1)

LIGHT OLIVE BROWN SANDY CLAY (CL) (2.5Y 5/4), firm, moist, slightly plastic, greenish gray mottling (5G 5/1), throughout spoon

LIGHT OLIVE BROWN SAND (SW) (2.5Y 5/4), loose, wet

End of Boring at 24'

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FIGURE

Log of Boring SB-F1
ICC
St. Croix, U.S. Virgin Islands

303803

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		4/28/95	

Equipment CME 65
Split Spoon
Elevation Not Measured Date 1/24/95

Blows/6 inches	Recovery (inches)	OVM Reading (ppm)	Odor	Depth (ft.) Sample	
7 8 8 8	18	0		0–1	LIGHT GRAY SANDY SILT (ML) (2.5Y 7/2), dry, soft, caliche visible
				1–2	LIGHT OLIVE BROWN SILTY CLAY (CL) (2.5Y 5/3), firm, dry, caliche, twigs, organics present
7 6 5 6	14	0		2–3	
				3–4	
7 6 8 12	18	0		4–5	
				5–6	
14 15 18 19	18	0		6–7	
				7–8	LIGHT OLIVE BROWN SILTY SAND (SM) (2.5Y 5/6), medium dense, dry
18 25 16 28	12	0		8–9	
				9–10	
				10–11	LIGHT OLIVE BROWN CLAYEY SAND (SC) (2.5Y 5/4), medium dense, dry
16 16 [illegible]	24	0		11–12	OLIVE YELLOW SILTY SAND (SM) (2.5Y 6/8), medium dense, dry
[illegible]	[illegible]	[illegible]		12–13	
				13–14	OLIVE GRAY SILTY GRAVEL (GM) (5Y 4/2), dense, dry, spoon impacts probably fracturing weathered limestone (rock)
				14–15	
[illegible]	[illegible]	[illegible]		15–16	GREENISH GRAY SANDY SILT (ML) (5GY 5/1), soft, dry
				16–17	YELLOWISH BROWN SILTY CLAY (CL) (10YR 5/4), soft, dry, greenish gray mottling (5GY 5/1), [illegible] soft and moist from 18–20 feet
				17–18	
				18–19	
[illegible]	[illegible]	[illegible]		19–20	
				20–21	
[illegible]	[illegible]	[illegible]		21–22	GREENISH GRAY SILTY SAND (SM) (5GY 5/1), medium dense, moist, wet at approx. 22 feet.
					End of Boring at 22'

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FIGURE

Log of Boring SB-F2
ICC
St. Croix, U.S. Virgin Islands 303804

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		4/28/95	

Equipment CME 65
Split Spoon
Elevation Not Measured Date 1/24/95

Blows/6 inches	Recovery (inches)	OVM Reading (ppm)	Odor	Depth (ft.)	Sample	
4 3 3 4	16			0–1		DARK BROWN SANDY SILT (ML) (10Y 3/3), dry, fine-medium gravel, noted 0-1'
				1–2		DARK GRAYISH BROWN CLAYEY SILT (ML) (10Y 4/2), firm, dry, caliche visible
6 5 5 6	14	0		2–3		
				3–4		OLIVE BROWN SILTY CLAY (CH) (2.5Y 4/3), firm, dry
5 4 4 6	14	0		4–5		
				5–6		DARK GREENISH GRAY SILTY CLAY (CH) (5GY 4/1), soft, dry
4 4 4 5	18	0		6–7		
				7–8		
3 5 8 17	14	0		8–9		DARK GREENISH GRAY SILTY CLAY (CH) (5GY 4/1), soft, moist from 8 feet
				9–10		VERY DARK GRAY SILTY GRAVEL (GM) (5Y 3/1), medium-dense, moist
10 17 [illegible]	20	0		10–11		DARK GREENISH GRAY CLAYEY SAND (SC) (5G 4/1), medium-dense, moist fine gravel throughout recovery (10%)
				11–12		
				12–13		Approximately 25% fine gravel 13' below ground surface
[illegible]	[illegible]	[illegible]		13–14		
				14–15		
				15–16		GREENISH GRAY SILTY CLAY (CH) (5BG 5/1), firm, moist
				16–17		
				17–18		
				18–19		
[illegible]				19–20		GREENISH GRAY SILTY SAND (SM) (5BG 5/1), medium-dense, moist
				20–21		
				21–22		GREENISH GRAY GRAVELLY SILTY SAND (SM) (5BG 5/1), medium-dense, wet at approximately 21'
				22		End of Boring at 22'

FIGURE

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Log of Boring SB-F3
ICC
St. Croix, U.S. Virgin Islands 303805

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		4/28/95	

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBLP-1
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 12/9/97	TOTAL DEPTH OF BOREHOLE: 17 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger - 4 1/4"	SEE FIGURE 3-3
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER 15.0' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: LABORATORY PIT			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES	DEPTH (Feet)
0						0
1						1
				Drilled to 8' bgs. No split spoons collected.		
8						8
	24	0	7	Stiff tan/brown CLAY, dry.		
9			8		8-10' bgs.	9
			12		VOCs, SVOCs, Metals	
10			15	Stiff tan CLAY, little sand, trace silt, dry.		10
11						11
12						12
13						13
14						14
15				Drilled from 10' to 15' bgs. No split spoons collected.		15
	24	0	6	Very stiff tan/white CLAY, trace sand/gravel, wet.		
16			9		15-17' bgs.	16
			11		VOCs, SVOCs, Metals	
17			17	End of boring @ 17.0' bgs.		17

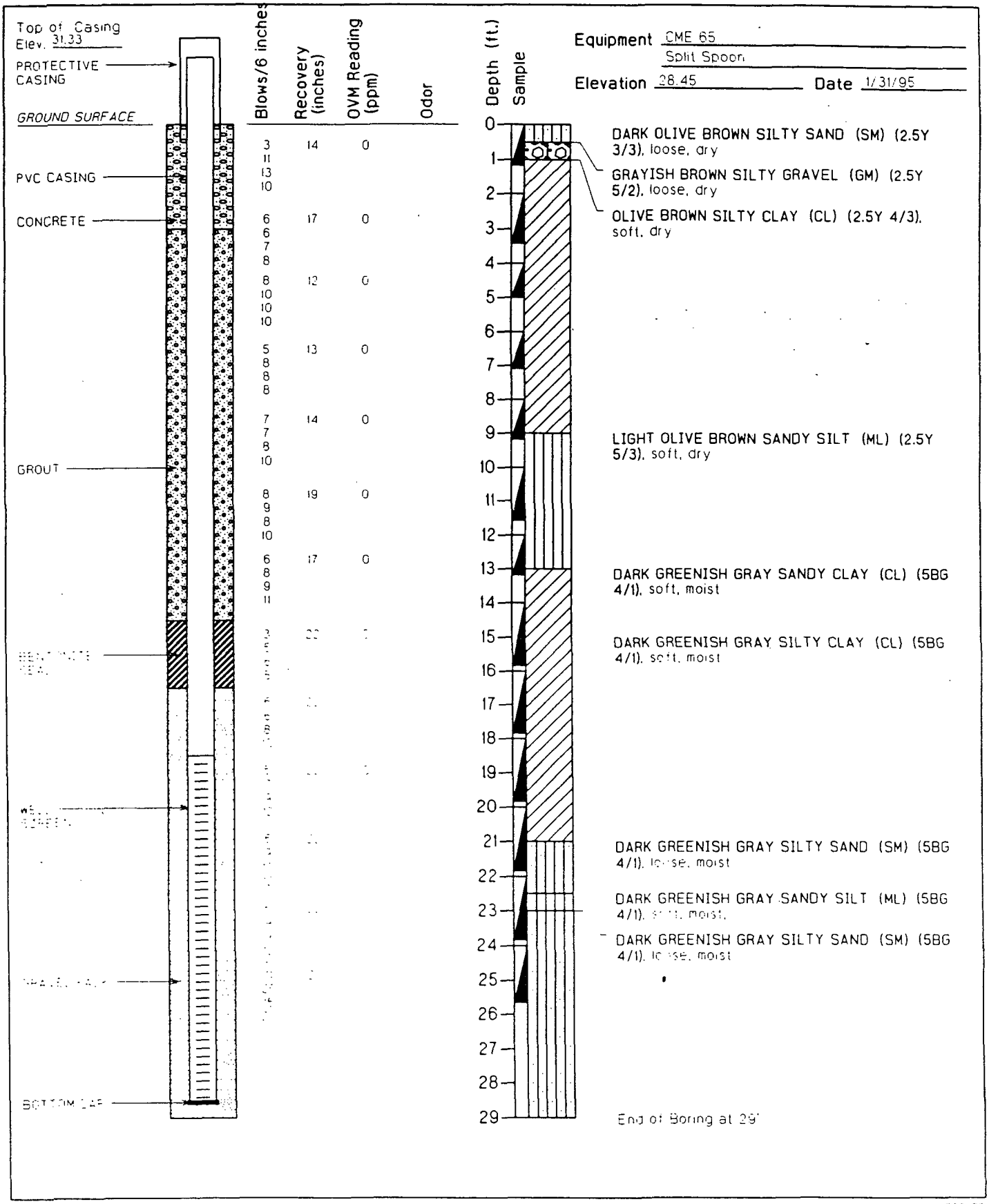
SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBLP-2
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-3
COMPLETION DATE: 12/9/97	TOTAL DEPTH OF BOREHOLE: 17 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: B-80	DRILLING METHOD / BIT: Hollow Stem Auger - 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: 15.5' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: LABORATORY PIT			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0					
1					
8				Drilled to 8' bgs. No split spoons collected.	
9	24	0	10	Stiff tan CLAY, some very stiff white clay throughout	
			10	split spoon, dry.	8-10' bgs.
			12		VOCs, SVOCs, Metals
10			18		
11					
12					
13				Drilled from 10' to 13' bgs. No split spoons collected.	
	24	0	17	Stiff tan CLAY, some sand, dry.	
14			9		13-15' bgs.
			14	Stiff olive fine/medium SAND, trace silt, dry.	VOCs, SVOCs, Metals
15			18	Stiff tan CLAY, some sand, dry.	
	20	0	7	Stiff olive fine SAND, some/little silt, dry.	
16			13	Stiff tan CLAY, some gravel, wet.	
			19		
17			20	End of boring @ 17.0' bgs.	

303807



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FIGURE

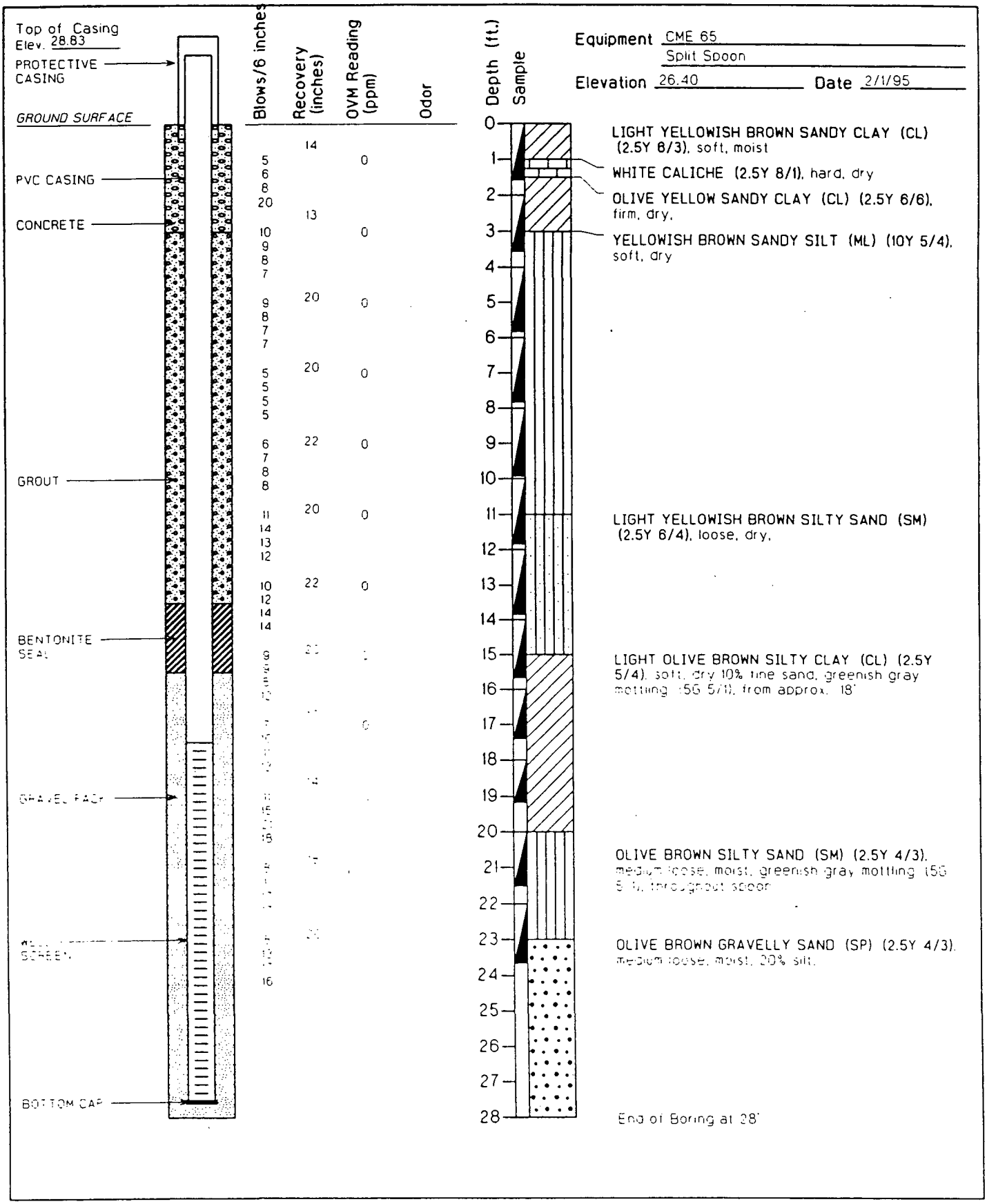
Log of Boring and Well Completion SB-C2 / MW-3

ICC

St. Croix, U.S. Virgin Islands

303808

DRAWN	PROJECT	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		7/26/95	



FIGURE

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Log of Boring and Well Completion SB-D4 / MW-5
ICC
St. Croix, U.S. Virgin Islands
303809

DRAWN	JOB NO.	APPROVED	DATE	REVISED DATE
JGY	29872.06.1		4/28/95	

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBCSD-1
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE FIGURE 3-2
COMPLETION DATE: 9/23/97	TOTAL DEPTH OF BOREHOLE: 26 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: BK-51	DRILLING METHOD / BIT: Hollow Stem Auger - 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: 20.0 bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: **PROCESS PIT AREA**			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	12	0	7	Firm brown silty SAND, dry.	
1			7		
			6		
2			6		
	14	0	4		
3			7		
			10		
4			12		
	18	0	4		
5			7		
			5		
6			8		
	24	0	4		
7			5		
			11		
8			12		
	24	0	7		
9			14		
			14		
10			20		
	20	0	4		
11			15		
			16		
12			16		
	20	0	4		
13			6		
			7		
14			10		
	20	0	4		
15			7		
			11		
16			14		
	24	0	6		
17			7		16-18' bgs.
			10		VOCs, SVOCs, METALS
18			14		
	18	0	3		
19			4		
			5	Soft tan CLAY, some/little sand, moist.	
20			6		
	24	0	3		
21			6		
			10	Stiff tan sandy CLAY, wet.	
22			14		
	16	0	4		
23			8		22-24' bgs.
			9		VOCs, SVOCs, METALS
24			14		
	14	0	4		
25			12		
			17		
26			23	End of Boring @ 26.0' bgs.	

303810

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBCSD-2
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 9/23/97	TOTAL DEPTH OF BOREHOLE: 26 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: CT&E	DRILLING EQUIPMENT: BK-51	DRILLING METHOD / BIT: Hollow Stem Auger - 4 1/4"	SEE FIGURE 3-2
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER 24.0' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: PROCESS PIT AREA			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	20	0	6	Stiff brown silty SAND, some gravel, (unnatural backfill), dry.	
1			12		
2			11		
			10		
3	12	0	3	Soft brown silty CLAY, some stone fragments, dry.	
			5		
4			3		
			5		
5	12	0	4		
			3		
6			4		
			7		
7	10	0	6		
			9		
8			12	Firm brown silty CLAY, some stone fragments, dry.	
			18		
9	14	0	3		
			7		
10			12		
			15		
11	18	0	5		
			12		
12			14	Stiff brown CLAY, some silt, dry.	
			18		
13	18	0	3		
			7		
14			12	Firm grey silty CLAY, dry.	
			14		
15	22	0	3		
			4		
16			5		
			8		
17	16	0	5		
			9		
18			12	Firm olive green silty CLAY, dry.	
			16		
19	16	6	4		
			5		18-20' bgs.
20			7	Soft olive green silty CLAY, dry.	VOCs, SVOCs, METALS
			9		
21	24	1	4		
			8		20-22' bgs.
22			12	Stiff olive green silty CLAY, dry.	VOCs, SVOCs, METALS
			14		
23	20	0	4		
			4		
24			10		
			16		
25	20	2	6		
			9		
26			16	Very stiff grey/olive green silty CLAY, moist.	
			24	End of Boring @ 26.0' bgs.	

303811

SOIL BORING LOG

McLaren Hart

PROJECT NAME:	PROJECT NO.:	Boring No: SBCSD-3
Island Chemical Site	12080.5380.001	
PROJECT LOCATION: St. Croix, US Virgin Islands		LOCATION SKETCH

COMPLETION DATE:	TOTAL DEPTH OF BOREHOLE:	MONITORING DEVICE:	GEOLOGIST / OFFICE:
9/24/97	26 Feet	OVM (PID)	C.Schneider/Warren

DRILLING CONTRACTOR / DRILLER:	DRILLING EQUIPMENT:	DRILLING METHOD / BIT:
CT&E	BK-51	Hollow Stem Auger - 4 1/4"

SAMPLING METHOD:	DEPTH TO GROUNDWATER	GROUND SURFACE ELEVATION:	WELL INSTALLED?
Split Spoon	20.0' bgs.	NA	No

SEE FIGURE 3-2

MEMO: **PROCESS PIT AREA**

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	20	0	5 10 14 16	Stiff brown sandy SILT. trace fill material, dry.	
1					
2					
3	20	0	5 13 16 18		
4					
5	10	0	5 9 11 14	Stiff brown silty CLAY, trace gravel, dry.	
6					
7	8	0	NA NA NA NA		
8					
9	16	0	7 7 11 14	Firm brown silty CLAY, trace gravel, dry.	
10					
11	10	9	7 14 15 20	Stiff brown silty CLAY, dry.	10-12' bgs. VOCs, SVOCs, METALS
12					
13	18	0	14 12 10 14		
14					
15	6	0	5 7 8 8	Firm dark brown silty CLAY, dry.	
16					
17	20	0	10 8 6 6		
18					
19	20	0	6 4 5 10	Firm olive/grey silty CLAY, moist.	18-20' bgs. VOCs, SVOCs, METALS
20					
21	12	0	NA NA NA NA	Firm black sandy SILT, wet.	
22					
23	0	0	5 18 30 42	Hard black sandy SILT, wet. End of Boring @ 24.0' bgs.	
24					

303812

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBRG-1
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE PLATE 1
COMPLETION DATE: 9/30/97	TOTAL DEPTH OF BOREHOLE: 14 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: SoilTech	DRILLING EQUIPMENT: Tripod	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: 12.5' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: RIVER GUT			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	3	0	1		
1			2		
			3	Soft brown silty CLAY, some/little sand, dry.	
2			2		
	3	0	4		
3			8		
			5	Firm light brown silt CLAY, little/trace fill material, dry.	
4			4		
	9	4	4		
5			10		
			20	Stiff fill material and red/brown SAND,	
6			20	some grey silty clay, dry.	
	14	100	10		
7			15		
			13	Stiff brown SAND, some silt, trace rock fragments, dry.	
8			15	Red/brown silty CLAY, some gravel, dry.	
	22	0	42		
9			40		8-10' bgs.
			41	Hard light brown silty CLAY and SAND, dry.	VOCs,SVOCs,METALS
10			50		
	24	0	28		
11			30		
			30	Hard light brown SAND, little silt, trace clay, dry.	
12			32		
	14	0	28		
13			36	Hard light brown SAND, trace silt and clay, wet.	12-14' bgs.
			50		VOCs,SVOCs,METALS
14			50	End of boring @ 14.0' bgs.	

303813

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBRG-2
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH: SEE PLATE 1
COMPLETION DATE: 9/30/97	TOTAL DEPTH OF BOREHOLE: 10 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: SoilTech	DRILLING EQUIPMENT: Tripod	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER: 10.0' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: RIVER GUT			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0	18	0	5		
1			14		
2			14 15	Soft light brown clayey SAND, dry.	
	4	0	8		
3			10		2-4' bgs.
4			12 20	Soft light brown clayey SAND, moist.	VOCs,SVOCs,METALS
	3	0	6		
5			7		4-6' bgs.
6			5 4		VOCs,SVOCs,METALS
	18	0	7	Stiff light brown very fine sandy CLAY, dry.	
7			7		
8			4 6	Black GRAVEL fragments and brown SAND, dry.	
	8	6	14		
9			14		
10			15 20	Medium-dense black GRAVEL, moist.	
	20	60	10		
11			17	Stiff brown CLAY, dry.	
12			17 20	End of boring @ 12.0' bgs.	

303814

SOIL BORING LOG

McLaren Hart

PROJECT NAME: Island Chemical Site	PROJECT NO.: 12080.5380.001		Boring No: SBRG-3
PROJECT LOCATION: St. Croix, US Virgin Islands			LOCATION SKETCH
COMPLETION DATE: 9/30/97	TOTAL DEPTH OF BOREHOLE: 10 Feet	MONITORING DEVICE: OVM (PID)	GEOLOGIST / OFFICE: C.Schneider/Warren
DRILLING CONTRACTOR / DRILLER: SoilTech	DRILLING EQUIPMENT: Tripod	DRILLING METHOD / BIT: Hollow Stem Auger- 4 1/4"	SEE PLATE 1
SAMPLING METHOD: Split Spoon	DEPTH TO GROUNDWATER 10.0' bgs	GROUND SURFACE ELEVATION: NA	WELL INSTALLED? No
MEMO: **RIVER GUT**			

DEPTH (Feet)	RECOVERY (in)	OVM (PPM)	BLOWS (per 6")	BURMISTER SOIL CLASSIFICATION SYSTEM Color, Texture, Moisture, Etc.	SAMPLES
0					
1					
6				Drilled to 6' bgs. No split spoons collected.	
7	8	15	5	Firm light brown SAND, medium gravel and fill, dry.	
			5		6-8' bgs.
8			6	Firm black sandy CLAY, dry.	VOCs,SVOCs,METALS
			2		
9	8	50	NA	Firm light brown SAND, some rock fragments, dry.	
			NA	Loose black GRAVEL, some silty CLAY, dry.	8-10' bgs.
			NA	Black coarse SAND, trace clay, dry.	VOCs,SVOCs,METALS
10			NA	End of boring @ 10.0 bgs.	

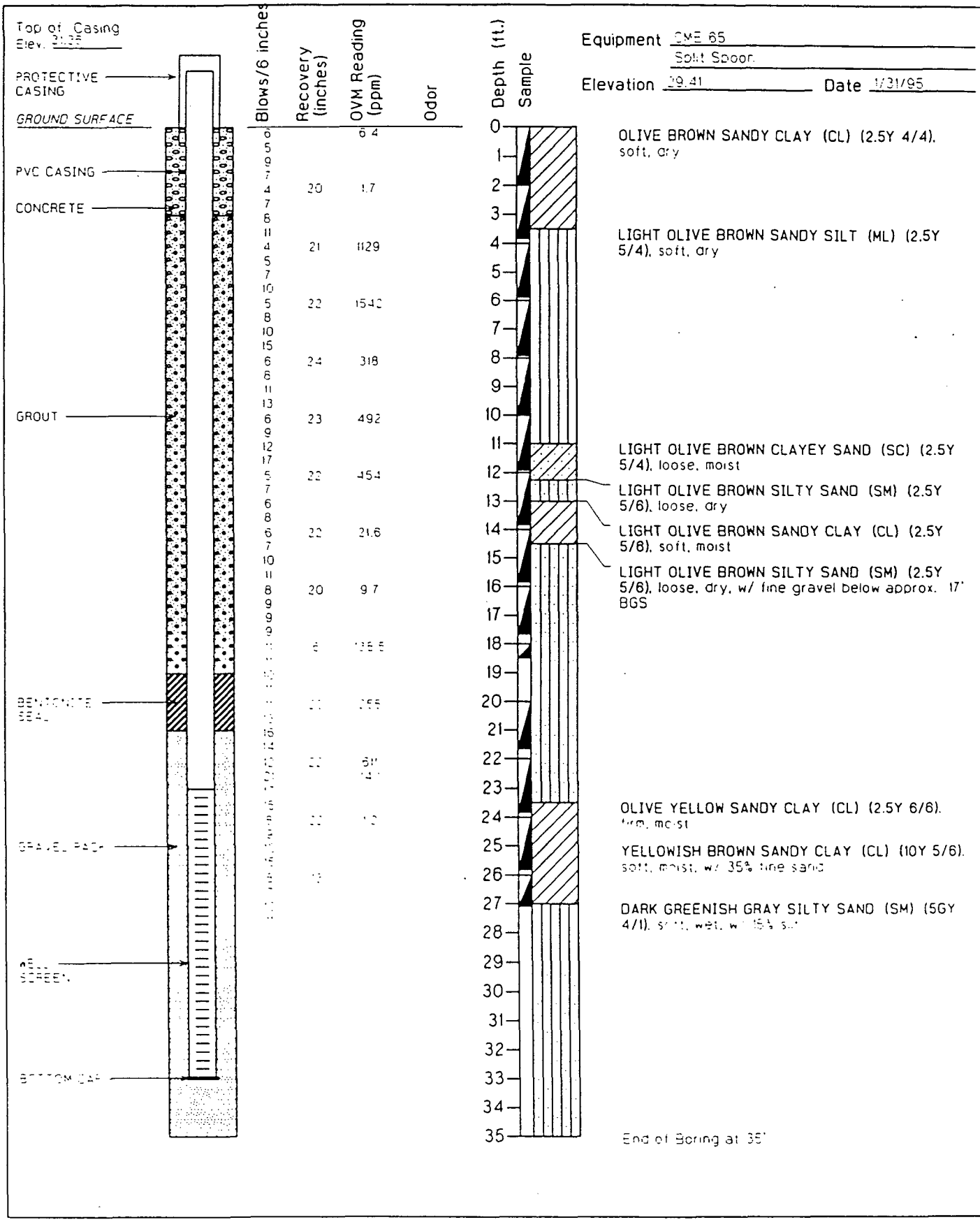
303815

G

303816

APPENDIX G

MONITORING WELL CONSTRUCTION DIAGRAMS



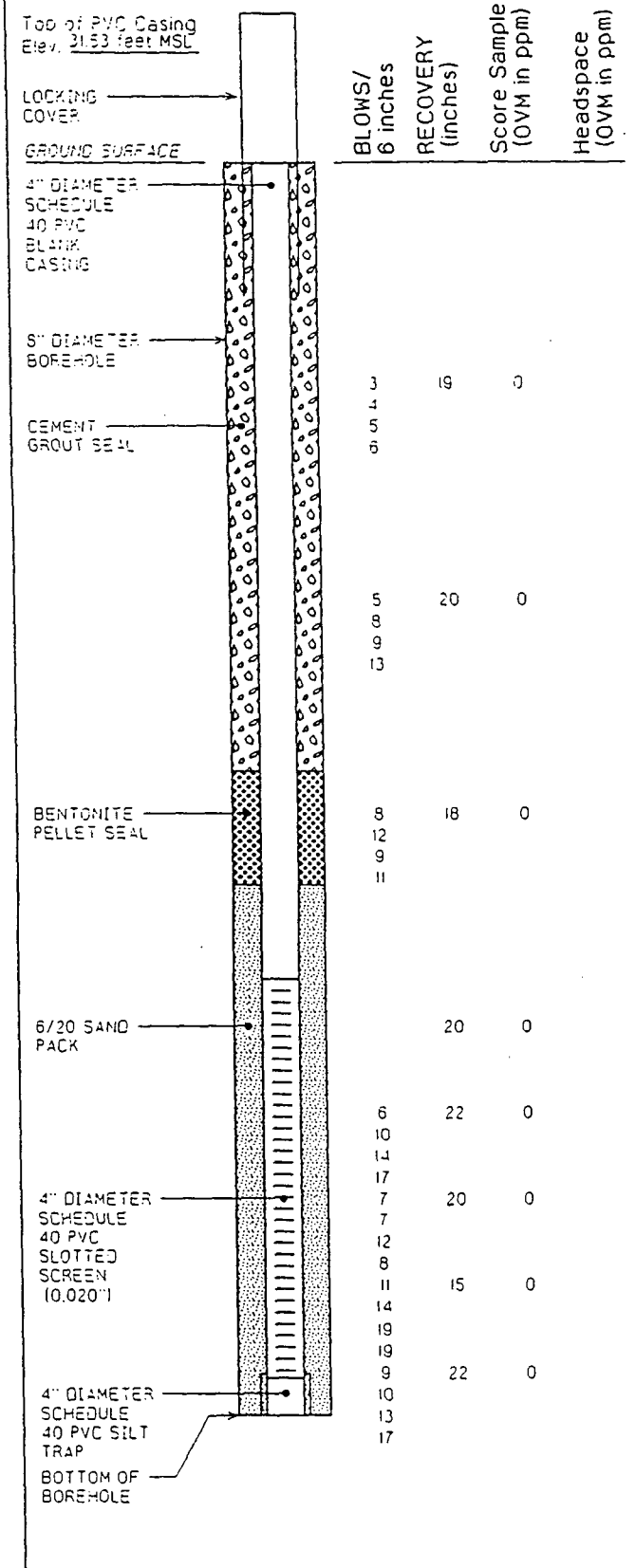
Harding Lawson Associates
Engineering and Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

FIGURE

Log of Boring and Well Completion SB-B1 / MW-1
ICC
St. Croix, U.S. Virgin Islands

303818

DRAWN	PROJECT	SUPERVISED	DATE	REVISED DATE
JGY	29872.06.1		7/26/95	



Depth (ft.) Sample	BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)
0–5	3, 4, 5, 6	19	0	
5–10	5, 8, 9, 13	20	0	
10–15	8, 12, 9, 11	18	0	
15–20		20	0	
20–25	6, 10, 14, 17	22	0	
25–30	7, 7, 12, 8, 11, 14, 19, 19	15	0	
30–32	9, 10, 13, 17	22	0	

Equipment Mobile B-53

Elevation _____ Date 05/30/96

Logged by David Kistner Checked by DJK 8/9

LIGHT OLIVE BROWN SANDY CLAY (CL): moist, firm, fine grained sand, plastic.

OLIVE BROWN CLAYEY SAND (SC/CL) (2.5 Y 4/4): moist, medium dense, predominately fine grained sand, slight plasticity.

Similar to 10 to 12 feet, except 10-15% gravel to 3/4 inch maximum and sand is medium to coarse grained.

Similar to 15 to 17 feet

OLIVE YELLOW SANDY CLAY (CL) (2 Y 6/8): moist, fine grained sand (weathered granite?), PALE OLIVE (2.5 Y 6/4) mottling.

OLIVE YELLOW SANDY CLAY (CL): similar to 21.3 to 22.0 feet.

OLIVE YELLOW CLAYEY SILTY SAND (SM/SC): wet, medium dense, with 5-15% gravel to 1 inch, sand is fine to medium grained.

Similar to 24 to 26 feet except 15-25% gravel to 1 inch maximum.

Similar to 24 to 26 feet except percentage of clay increases between 29 and 30 feet (SC).

Terminated boring at 30 feet BGS at 1400. Pull 3.25 inch ID hollow stem augers. Ream boring with 8 inch solid stem augers to 29 feet BGS. Install 4 inch ID PVC monitoring well.

NM Not Measured

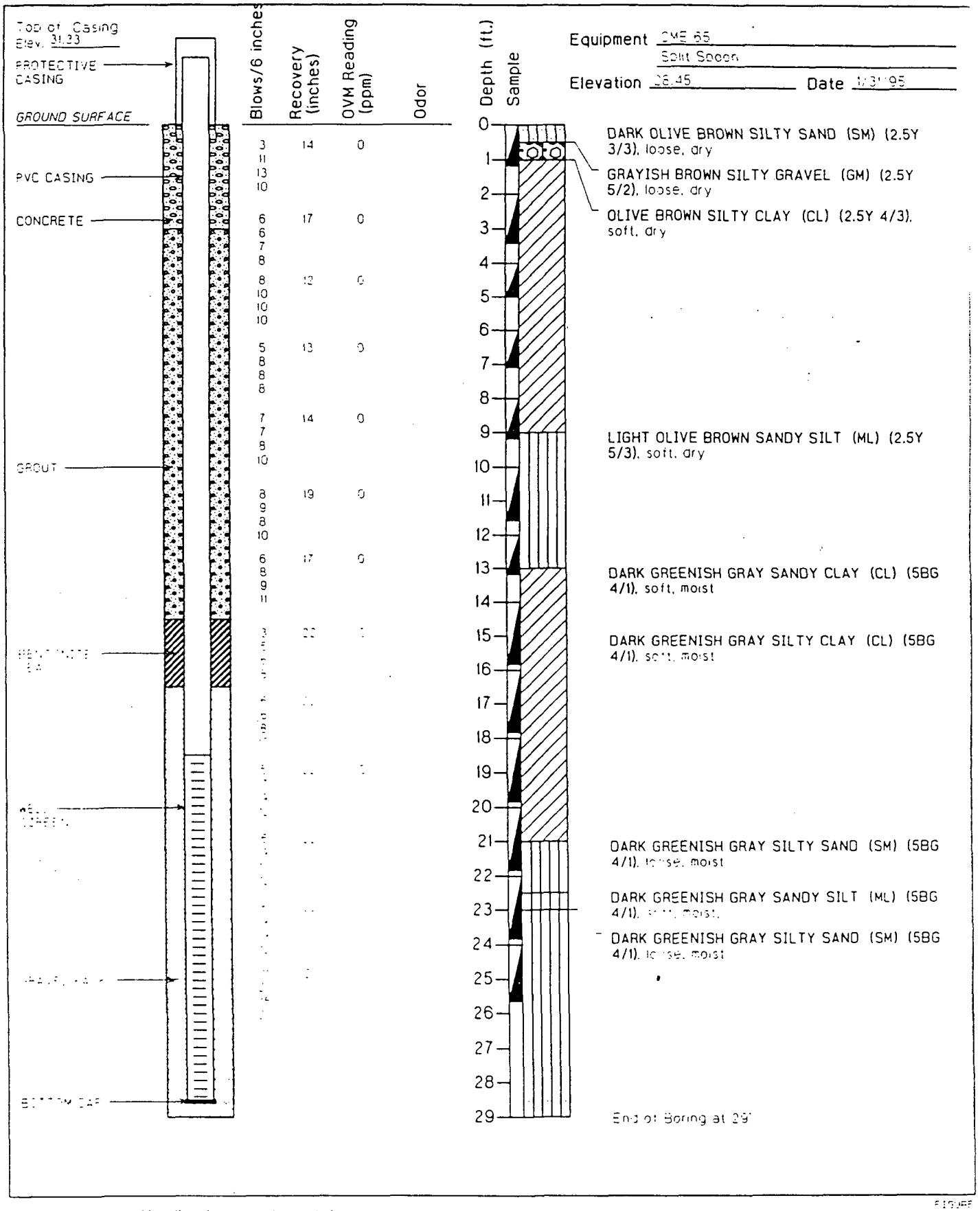
FIGURE

Harding Lawson Associates
Engineering and Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring and Well Completion MW-2
Island Chemical Company
St. Croix, U.S. Virgin Islands

303819

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
WGA	35241.2.12		08/10/96	

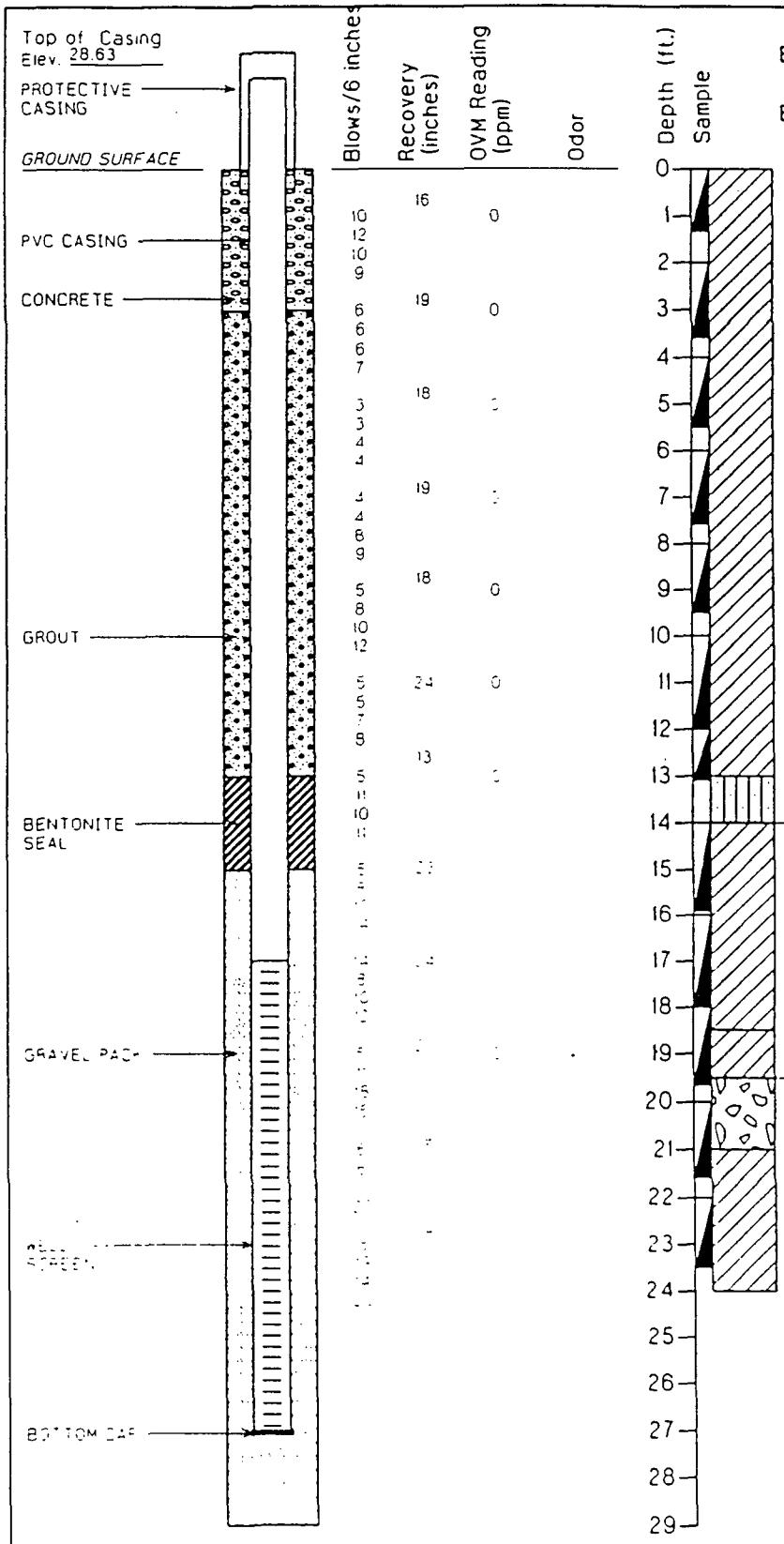


FIGURE

Harding Lawson Associates
Engineering and Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

Log of Boring and Well Completion SB-C2 / MW-3
ICC
St. Croix, U.S. Virgin Islands **303820**

JGY	29872.06.1		7/26/95	



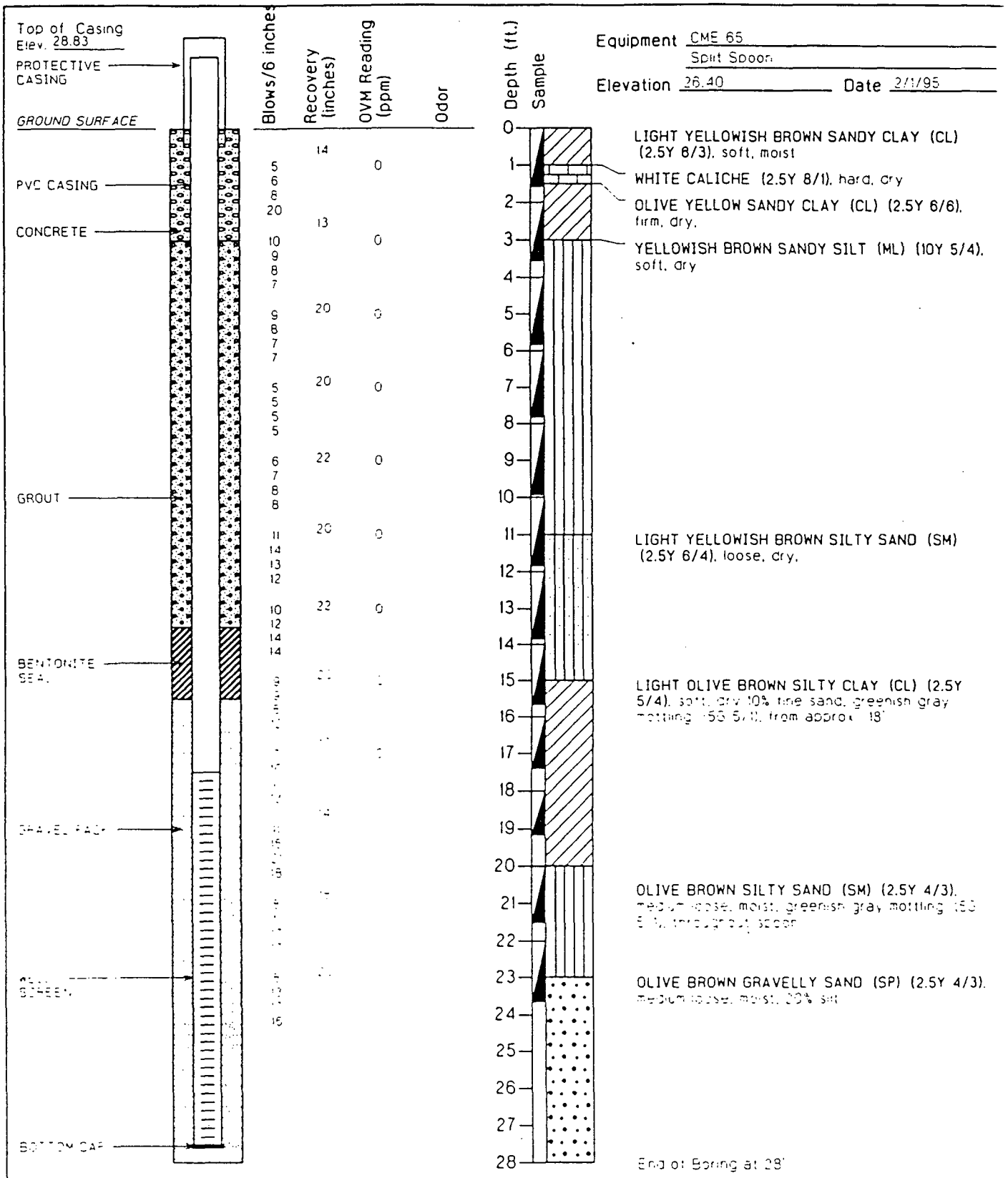
Harding Lawson Associates
Engineering and Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-827-4505

Log of Boring and Well Completion SB-01 / MW-4
ICC
St. Croix, U.S. Virgin Islands

303821

FIGURE

DRAWN JSW | JOB NO. 29872.06.1 | APPROVED | DATE 4/28/95 | REVISED DATE



Harding Lawson Associates
Engineering and Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

FIGURE

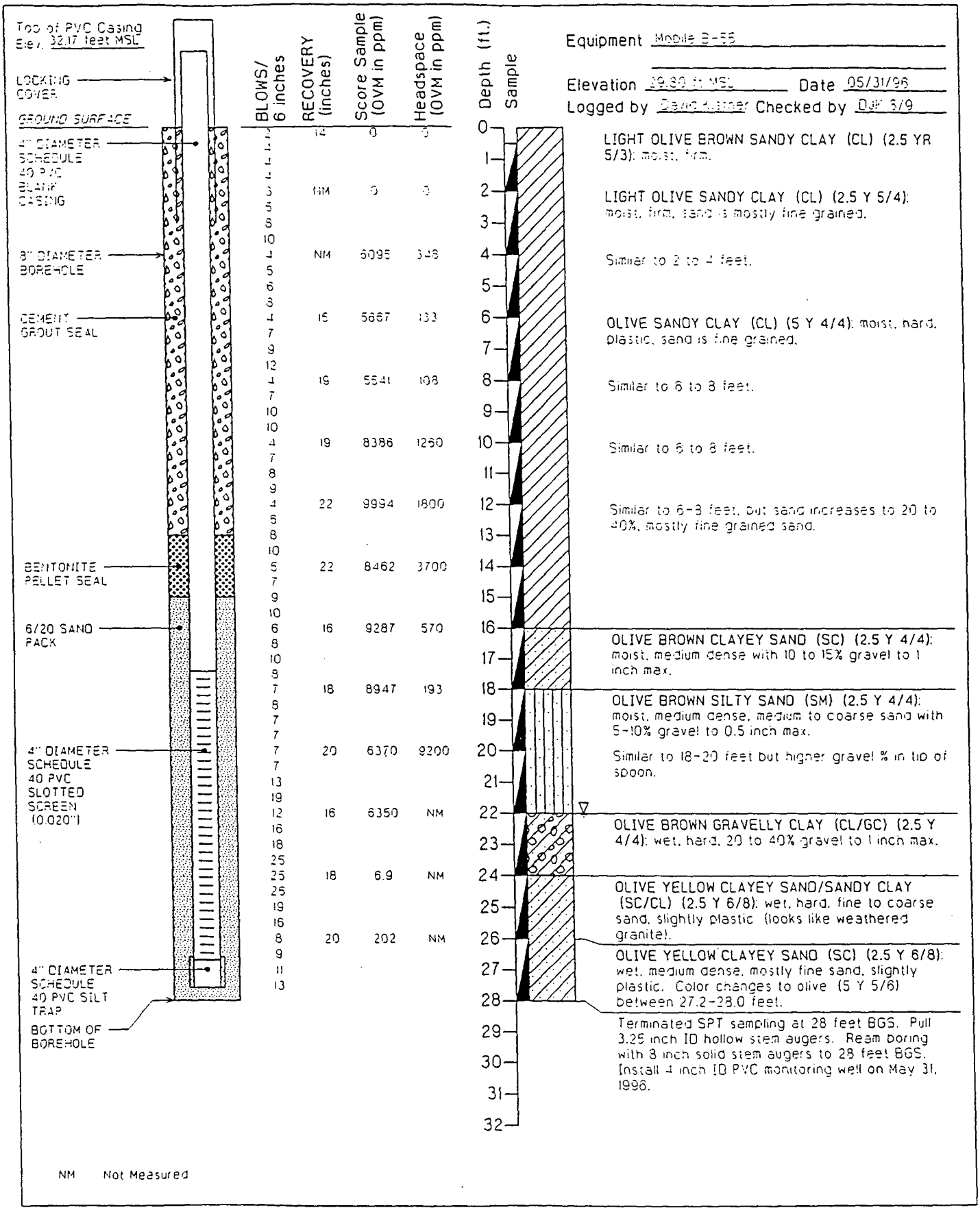
Log of Boring and Well Completion SB-04 / MW-5

ICC

St. Croix, U.S. Virgin Islands

303822

DRAWN	JOB NO.	SCALE	DATE	REVISED DATE
JGY	29872.06.1		4/28/95	



BLOWS/ 6 inches	RECOVERY (inches)	Score Sample (OVM in ppm)	Headspace (OVM in ppm)
1 1 1	12	0	0
1 2 3	NM	0	0
3 5 6			
10 4 5	NM	6095	348
6 8 3	15	5667	133
4 7 9			
12 4 7	19	5541	108
10 10 4	19	8386	1260
7 8 9			
4 5 8	22	9994	1800
10 5 7	22	8462	3700
9 10 6	16	9287	570
8 10 9			
7 8 7	18	8947	193
7 7 7	20	6370	9200
13 19 12	16	6350	NM
16 18 25			
25 25 19	18	6.9	NM
16 8 9	20	202	NM
11 13			

NM Not Measured

FIGURE

Harding Lawson Associates
Engineering and Environmental Services
14 Washington Road Bldg 7
Princeton Junction, New Jersey 08550
609-936-0700

Log of Boring and Well Completion SBB17/MW-8
Island Chemical Company
St. Croix, U.S. Virgin Islands

303823

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
DJK	35241.2.12		07/10/96	

MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-7	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St. Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: C.Schneider/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Mud Rotary Tricone	N/A	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
29.37' msl	9.45' msl		

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
1				Spilt spoon samples not collected.	Concrete (0-2')
2					
17				Drilled to 17' bgs.	12" Borehole
18					Grout (2-34'')
19					
20					8" Steel Casing (0-34')
21					
22					4" Diameter PVC Riser (0-64')
60				Drilled from 22' - 60' bgs.	Cement/Bentonite Slurry (0-60')
61					Bentonite (60-62')
62					
63					
64					#1 Morie Sand (62-75')
65				SAND, some silt and clay	4" Diameter 0.020 Slot PVC Screen (64-74')
66					
67					
68					
69					
70	64-74' bgs Metals VOCs SVOCs			Zone of COBBLES from 70' - 72' bgs.	
71					
72					
73				Tight CLAY from 72' - 74' bgs.	
74					End Cap at 74'
75				SAND from 74' - 75' bgs. End of boring at 75' bgs.	8" Borehole

WELL CONSTRUCTION

303824

MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-8	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St. Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: C.Schneider/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Mud Rotary Tricone	N/A	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
30.27' msl	9.64' msl		

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
1					Concrete (0-2')
2					
				Drilled to 17' bgs.	12" Borehole (0-35')
17					Grout (2-35')
18					
19					8" Steel Casing (0-35')
20					
21					4" Diameter PVC Riser (0-64')
22					
				Drilled from 17' - 60' bgs.	
60					Cement/Bentonite Slurry (0-60')
61					
62					Bentonite (60-62')
63					
64					#1 Morie Sand (62-75')
65				SAND, some silt and clay	
66					4" Diameter 0.020 Slot PVC Screen (64-74')
67					
68	63-73' bgs				
69	Metals VOCs SVOCs				
70				Zone of COBBLES from 70' - 72' bgs.	
71					
72					
73				Tight CLAY from 72' - 74' bgs.	
74					End Cap at 74'
				SAND from 74' - 75' bgs.	
75				End of boring at 75'.	8" Borehole

WELL CONSTRUCTION

303825

MONITORING WELL LOG

McLaren Hart

BORING NO.: MW-9	PROJECT NO.: 12080.5380.001	PROJECT NAME: Island Chemical Site	LOCATION SKETCH: SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: C.Schneider/Warren	
DRILLING EQUIPMENT: B-80	DRILLING CONTRACTOR / DRILLER: CTE	COMPLETION DATE: 12/6/97	PERMIT NUMBER:
WELL INSTALLED? YES	DRILLING METHOD / BIT: Mud Rotary Tricone	SAMPLING METHOD: N/A	
GROUND SURFACE ELEVATION: 26.78' msl	STATIC WATER LEVEL: 9.53' msl	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
1				Spilt spoon samples not collected.	Concrete (0-2')
2					
17				Drilled to 17' bgs.	12" Borehole (0-32')
18					Grout (2-32')
19					
20					8" Steel Casing (0-32')
21					
22					4" Diameter PVC Riser (0-64')
32				Drilled from 17' - 32' bgs.	
33				Generally CLAY, some silt.	
34					
35					
36					Cement/Bentonite Slurry (0-60')
60				Drilled from 36' - 60' bgs.	
61					Bentonite (60-62')
62					
63					
64					#1 Morie Sand (62-76')
65				SAND, some silt and clay	
66					4" Diameter 0.020 Slot PVC Screen (64-74')
67					
68					
69	64-74' bgs Metals VOCs				
70	SVOCs			Zone of COBBLES from 70' - 72' bgs.	
71					
72					
73				Tight CLAY from 72' - 74' bgs.	
74					End Cap at 74'
75				SAND from 74' - 76' bgs.	8" Borehole
76				End of boring at 76' bgs.	

WELL CONSTRUCTION

303826

MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-10	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: C.Schneider/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
BK-51	CT&E	12/6/97	
WELL INSTALLED? YES	DRILLING METHOD / BIT: Mud Rotary	SAMPLING METHOD: N/A	
GROUND SURFACE ELEVATION: 32.01' msl	STATIC WATER LEVEL: 10.11' msl	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS	WELL CONSTRUCTION
1				Split Spoon Samples not collected.	Concrete (0-2')	
2						
				Drilled to 17' bgs.		
17					Grout (2-18')	
18						
19					Bentonite (18-20')	
20						
21					#1 Morie Sand (20-33')	
22					4" Diameter PVC Riser (0-22')	
23					4" Diameter 0.020 Slot PVC Screen (22-32')	
24						
25						
26	22-32' bgs					
27	Metals					
28	VOCs SVOCs					
29						
30						
31						
32					End Cap at 32'	
33				Drilled from 17' - 33' bgs. End of boring at 33' bgs.		

303827

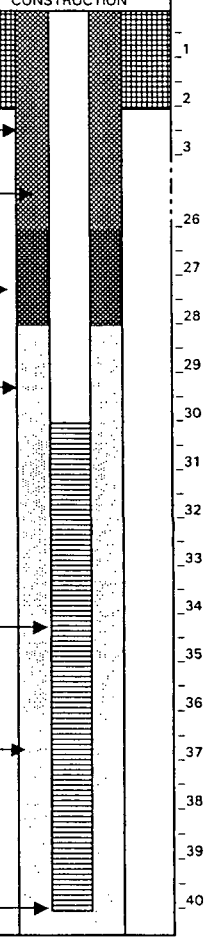
MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-11 (GWPP-29A)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED? YES	DRILLING METHOD / BIT: Mud Rotary Tricone	SAMPLING METHOD: N/A	
GROUND SURFACE ELEVATION: 38.17' msl	STATIC WATER LEVEL: 6.29' msl	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION
1				
2				
3				
				Drilled to 26' bgs.
26				
27				
28				
29				
30				Drilled from 26' - 30' bgs.
31		50		Medium brown CLAY, trace sand, dry.
32				
33		50		Medium brown CLAY, trace sand, dry.
34				
35	30-40' bgs VOCs	75		Medium brown CLAY, trace sand, dry. Medium brown CLAY, some coarse sand,
36				little gravel, dry.
37		50		Medium brown CLAY, some gray silty clay and
38				gravel, dry.
39				
40				Drilled from 38' - 40' bgs. End of boring at 40' bgs.



303828

MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-12 (GWPP-29A)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Mud Rotary Tricone	N/A	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
38.46' msl	5.18' msl		

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
1					Concrete (0-2')
2					
				Drilled to 30' bgs.	
30		50			
31				Medium brown CLAY, trace sand, dry.	4" Diameter PVC Riser (0-137')
32					
33		50			
34				Medium brown CLAY, trace sand, dry.	
35		75		Medium brown CLAY, trace sand, dry.	
36				Medium brown CLAY, some coarse sand, little gravel, dry.	
37		50			
38				Medium brown CLAY, some gray silty clay and gravel, dry.	
39					
40					
41					
42				Drilled from 38' - 42' bgs.	
43		90		Medium brown and gray CLAY, trace fine sand, dry.	
44					
45		75			
46				Medium brown and gray CLAY, trace fine sand, dry.	
47		75			
48				Medium brown and gray CLAY, trace fine sand, dry.	
49		60		Medium brown and gray CLAY, trace fine sand, dry.	
50				Medium brown coarse SAND, some clay, little gravel, slightly moist.	
51					Cement/Bentonite Slurry (0 - 133')
52					
53					
54					
55					

WELL CONSTRUCTION

303829

MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-12 (GWPP-29A)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED? YES	DRILLING METHOD / BIT: Mud Rotary Tricone	SAMPLING METHOD: N/A	
GROUND SURFACE ELEVATION: 38.46' msl	STATIC WATER LEVEL: 5.18' msl	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS	WELL CONSTRUCTION
56						
57						
58				Drilled from 50' - 58' bgs.		
59		75		Medium brown coarse SAND, some clay, little gravel, dry.		
60				Grayish white CLAY, little silt ,trace gravel. hard, dry.		
61						
62						
63						
64						
65				Drilled from 60' - 65' bgs.		
66		50		Medium brown CLAY, trace silt.		
67						
68					Cement/Bentonite Slurry (0 - 133') →	
69						
70				Drilled from 67' - 70' bgs.		
71		50		Medium brown CLAY, trace silt.		
72						
73						
74						
75				Drilled from 72' - 75' bgs.		
76		50		Medium gray CLAY, little sand.		
77						
78						
79						
80				Drilled from 77' - 80' bgs.		
81		100		Intermixed medium brown/ light gray CLAY, trace silt, dry.		
82						
83						
84						
85				Drilled from 82' - 85' bgs.		

303830

MONITORING WELL LOG

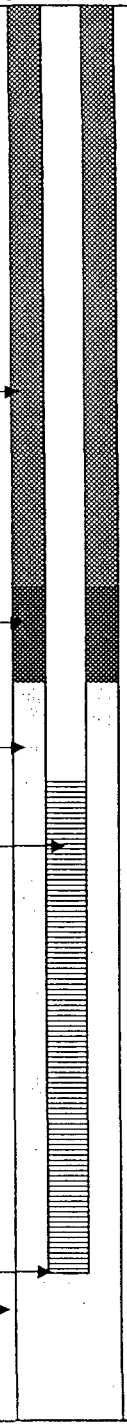
McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-12 (GWPP-29A)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED? YES	DRILLING METHOD / BIT: Mud Rotary Tricone	SAMPLING METHOD: N/A	
GROUND SURFACE ELEVATION: 38.46' msl	STATIC WATER LEVEL: 5.18' msl	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
86		100		Intermixed medium brown/ light gray CLAY, trace silt, dry.	
87					
88					
89					
90				Drilled from 87' - 90' bgs.	
91		50		Light brown/gray CLAY, some silt, little coarse sand, dry.	
92					
100				Drilled from 92' - 100' bgs.	Cement/Bentonite Slurry (0 - 133')
101		100		Light brown/ white clay, some silt, trace rock.	
102					
133				Drilled from 102' - 133' bgs.	
134					Bentonite (133-135')
135					
136					#1\Morie Sand (135-147')
137					
138					4" Diameter 0.020 Slot PVC Screen (147-137')
139					
140					
141	137-147' bgs VOCs				
142					
143					
144					
145	137-147' bgs VOCs				
146					
147					End Cap 147'
148					8" Borehole
149					
150				Drilled from 102' - 150' bgs. End of boring at 150' bgs.	

WELL CONSTRUCTION



303831

MONITORING WELL LOG

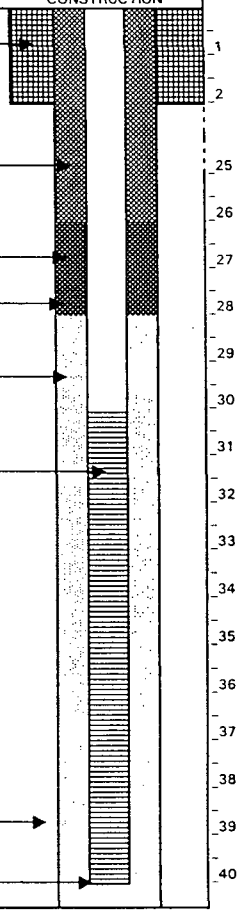
McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-13 (GWPP-37A)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Mud Rotary Tricone	N/A	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
38.38' msl	6.42' msl		

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
1					Concrete (0-2')
2					
				Drilled to 25' bgs.	
25					Cement/Bentonite Slurry (0 - 26')
26		75		Medium brown CLAY, little sand, dry.	
27					Bentonite (26-28')
28					4" Diameter PVC Riser (0-30')
29					#1 Morie Sand (28-40')
30				Drilled from 27' - 30' bgs.	
31		100		Medium brown CLAY, some sand, little gravel, dry.	4" Diameter 0.020 Slot PVC Screen (30-40')
32					
33		100		Medium brown SAND, some gravel, moist.	
34					
35					
36	30-40' bgs VOCs				
37					
38					
39					8" Borehole
40				Drilled from 34' - 40' bgs. End of boring at 40' bgs.	End Cap at 40'

WELL CONSTRUCTION



303832

MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-14 (GWPP-37)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Mud Rotary Tricone	N/A	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
38.44' msl	7.02' msl		

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
1					Concrete (0-2')
2					
				Drilled to 25' bgs.	
25					
26		100		Medium brown CLAY, little sand, dry.	
27					
28					
29					
30				Drilled from 27' - 30' bgs.	
31		100		Medium brown CLAY, some sand, little gravel, dry.	
32					
33		100		Medium brown SAND, some gravel, slightly moist.	Cement/Bentonite Slurry (0 - 118')
34					
35					
36					
37					
38					
39					
40				Drilled from 34' - 40' bgs.	
41		60		Grayish brown CLAY, some silt and coarse gravel, dry. Medium brown SAND, some coarse gravel, little silt, dry.	
42					8" Borehole
43					
44					
45					
46					
47					
48					
49					
50				Drilled from 42' - 50' bgs.	

WELL CONSTRUCTION

303833

MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-14 (GWPP-37)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED? YES	DRILLING METHOD / BIT: Mud Rotary Tricone	SAMPLING METHOD: N/A	
GROUND SURFACE ELEVATION: 38.44' msl	STATIC WATER LEVEL: 7.02' msl	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS	WELL CONSTRUCTION
51		100		Medium brown CLAY, little sand and gravel, moist.		
52						
53						
54						
55					4" Diameter PVC Riser (0-124')	
56						
57						
58						
59						
60				Drilled from 52' - 60' bgs.		
61		100		Medium brown and grayish CLAY, little loose sand, dry.		
62						
63		100		Grayish CLAY, trace sand and gravel, drt.		
64					Cement/Bentonite Slurry (0 - 118')	
65		100		Gray CLAY, little sand and gravel, dry.		
66						
67		100		Medium brown CLAY, some sand and dark brown gravel, slightly moist.		
68						
69						
70						
71						
72						
73						
74						
75				Drilled from 68' - 75' bgs.		
76		100		Medium brown SAND, some clay, trace gravel, slightly moist.		
77						
78						
79						

303834

MONITORING WELL LOG

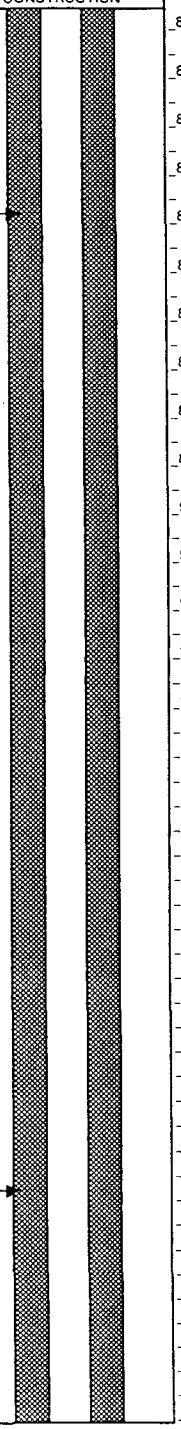
McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-14 (GWPP-37)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Mud Rotary Tricone	N/A	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
38.44' msl	7.02' msl		

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
80					
81					
82					
83					
84					Cement/Bentonite Slurry (0 - 118')
85				Drilled from 77' - 85' bgs.	
86		100		Medium brown CLAY, trace sand, dry.	
87					
88		100		Light brown stiff CLAY, some fine sand, trace sandstone, dry.	
89					
90		100		White CLAY, some silt, dry.	
91					
92		100		Stiff CLAY, some weathered sand stone, dry.	
93					
94					
95					
96					
97					
98					
99					
100					
101					
102					
103					
104					Cement/Bentonite Slurry (0 - 118')
105					
106					
107					
108					

WELL CONSTRUCTION



303835

MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
MW-14 (GWPP-37)	12080.5380.001	Island Chemical Site	SEE FIGURE 3-5
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: N.Eichlin/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
B-80	CTE	12/6/97	
WELL INSTALLED? YES	DRILLING METHOD / BIT: Mud Rotary Tricone	SAMPLING METHOD: N/A	
GROUND SURFACE ELEVATION: 38.44' msl	STATIC WATER LEVEL: 7.02' msl	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (%)	BLOWS /6"	DESCRIPTION	REMARKS
109					
110				Drilled from 92' - 110' bgs.	
111		45		Light gray/ brown CLAY, little silt, sand, pieces of bedrock, dry.	
112					
113					
114					
115					
116					
117					
118					
119					
120				Drilled from 112' - 120' bgs.	Bentonite (118-120')
121		85		Light gray/ brown stiff CLAY, little sand and pieces of bedrock, dry.	
122					
123					
124					#1 Morie Sand (120-134')
125					
126					
127					
128					
129	124-134' bgs VOCs				4" Diameter 0.020 Slot PVC Screen (124-134')
130					
131					
132					
133					
134				Drilled from 122' - 134' bgs. End of boring 134' bgs	End cap at 134'

WELL CONSTRUCTION

303836

MONITORING WELL LOG

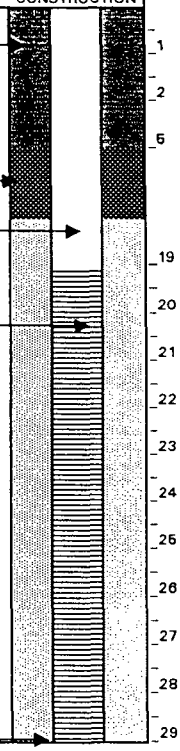
McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
TW-01	12080.6380.001	Island Chemical Site	SEE FIGURE 3-8
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: C.Schneider/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
BK-51	SoilTech	9/16/97	N/A
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Hollow-Stem Auger	Split Spoon	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
30.45 feet above msl	Approx 24' bgs		

DEPTH (FT.)	SAMPLE NUMBER	REC. (in)	BLOWS /6"	DESCRIPTION	REMARKS
1					Sand (0-5')
2					*Note: Natural formation not used due to high OVM reading in drill cuttings.*
				Drilled to 20' bgs.	Bentonite (5-18')
					2" Diameter PVC Riser (0-19')
20					2" Diameter 0.020 Slot PVC Screen (19-29')
21		14"	7 10	Greenish medium SAND, some silt and gravel.	
22			10 12		
23		20"	11 18	Gray, silty SAND, some clay. Silty SAND w/ carbonate, rock fragments.	
24			18 23	Moisture encountered at 24' bgs.	
26		24"	10 23	Gray, medium GRAVEL, dry.	
26			23 18	Gray, gravelly CLAY.	
27					
28					
29				Drilled to 29' bgs. End of boring at 29' bgs.	End Cap at 29'

WELL CONSTRUCTION



MONITORING WELL LOG

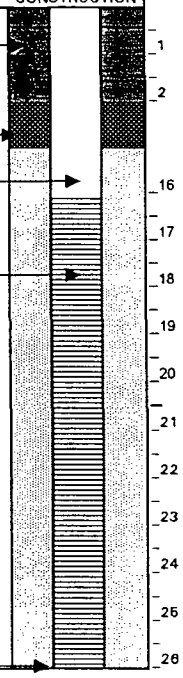
McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
TW-02	12080.6380.001	Island Chemical Site	SEE FIGURE 3-8
LOCATION:		GEOLOGIST / OFFICE:	
St.Croix U.S. Virgin Islands		C.Schneider/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
BK-51	SoilTech	9/16/97	N/A
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Hollow-Stem Auger	Split Spoon	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
31.10 feet above msl	Approx 21' bgs		

DEPTH (FT.)	SAMPLE NUMBER	REC. (in)	BLOWS /6"	DESCRIPTION	REMARKS
1					Natural Formation (0-14')
2					
				Drilled to 20' bgs.	Bentonite (14-16')
					2" Diameter PVC Riser (0-16')
					2" Diameter 0.020 Slot PVC Screen (16-26')
20					
21		10"	5	Sandy, clayey, f-m GRAVEL, med brown, some	
			17	fragments of carbonate rocks, trace volc. rock	
			24	fragments.	
22			26		
23		9"	14	Silty sandy CLAY w/ f-m gravel.	
			20	Moisture encountered.	
			23		
24			26		
25					
26				Drilled to 26' bgs. End of boring at 26' bgs.	End Cap at 26'

WELL CONSTRUCTION



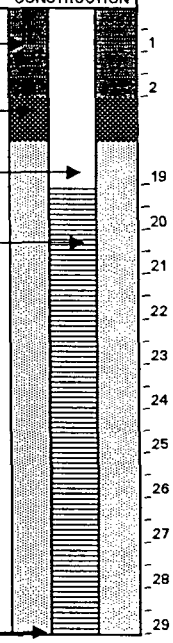
MONITORING WELL LOG

McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
TW-03	12080.5380.001	Island Chemical Site	SEE FIGURE 3-8
LOCATION:		GEOLOGIST / OFFICE:	
St.Croix U.S. Virgin Islands		C.Schneider/Warren	

DRILLING EQUIPMENT	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
BK-51	SoilTech	9/18/97	N/A
WELL INSTALLED?	DRILLING METHOD / BIT:	SAMPLING METHOD:	
YES	Hollow-Stem Auger	Split Spoon	
GROUND SURFACE ELEVATION:	STATIC WATER LEVEL:	NOTE:	
31.63 feet above msl	Approx 24' bgs		

DEPTH (FT.)	SAMPLE NUMBER	REC. (in)	BLOWS /6"	DESCRIPTION	REMARKS
1					Natural Formation (0-19')
2					
					Bentonite (19-21')
					2" Diameter PVC Riser (0-22')
					2" Diameter 0.020 Slot PVC Screen (19-29')
				Drilled to 22' bgs.	
22					
23		18"	16	CLAY, some SILT, dk-med brown. Moist.	
			12	Med gray med SAND, some-little SILT.	
24			17	Slightly moist. silty CLAY w/ f-c gravel, carb/volc rock frag.	
			32	Moisture encountered at 24' bgs.	
25		0"	50	Refusal	
				Spoon wet at bottom 3"	
26				Free water in augers (1-2")	
27					
28					
29				Drilled to 29' bgs. End of boring at 29' bgs.	End Cap at 29'



303839

MONITORING WELL LOG

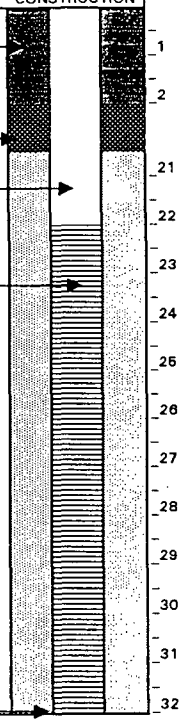
McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
TW-04	12080.6380.001	Island Chemical Site	SEE FIGURE 3-8
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: C.Schneider/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
BK-51	SoilTech	9/19/97	N/A
WELL INSTALLED? YES	DRILLING METHOD / BIT: Hollow-Stem Auger	SAMPLING METHOD: Split Spoon	
GROUND SURFACE ELEVATION: 30.61 feet above msl	STATIC WATER LEVEL: Approx 27' bgs	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (in)	BLOWS /6"	DESCRIPTION	REMARKS
1					Natural Formation (0-19')
2					
				Drilled to 22' bgs.	Bentonite (19-21')
21					2" Diameter PVC Riser (0-22')
22					
23		16"	20	Light brown, sandy SILT, some medium gravel,	
			20	dry.	2" Diameter 0.020 Slot PVC Screen (22-32')
24			22		
			14	Moisture encountered at 24' bgs.	
25		14"	8	Light brown, sandy SILT, some clay, medium	
			13	gravel, dry.	
26			19		
			22		
27					
28					
29					
30					
31					
32				Drilled to 32' bgs. End of boring at 32' bgs.	End Cap at 32'

WELL CONSTRUCTION



MONITORING WELL LOG

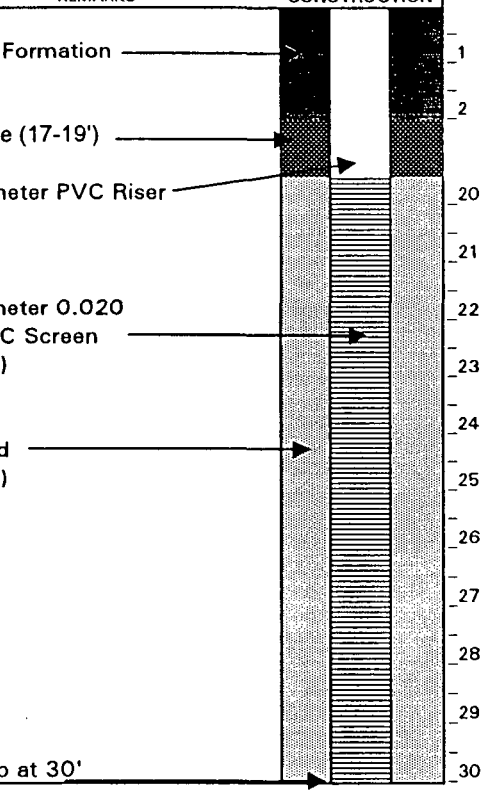
McLaren Hart

BORING NO.:	PROJECT NO.:	PROJECT NAME:	LOCATION SKETCH
TW-05	12080.5380.001	Island Chemical Site	SEE FIGURE 3-8
LOCATION: St.Croix U.S. Virgin Islands		GEOLOGIST / OFFICE: C.Schneider/Warren	

DRILLING EQUIPMENT:	DRILLING CONTRACTOR / DRILLER:	COMPLETION DATE:	PERMIT NUMBER:
BK-51	SoilTech	9/20/97	N/A
WELL INSTALLED? YES	DRILLING METHOD / BIT: Hollow-Stem Auger	SAMPLING METHOD: Split Spoon	
GROUND SURFACE ELEVATION: 32.14 feet above msl	STATIC WATER LEVEL: Approx 27' bgs	NOTE:	

DEPTH (FT.)	SAMPLE NUMBER	REC. (in)	BLOWS /6"	DESCRIPTION	REMARKS
1					Natural Formation (0-18')
2					
				Drilled to 20' bgs.	Bentonite (17-19')
20			NA	Brown, clayey silt, moist.	2" Diameter PVC Riser (0-20')
			NA		
21			NA		
			NA		
22			NA		2" Diameter 0.020 Slot PVC Screen (20-30')
			NA	Brown, clayey silt, moist.	
23			NA		
			NA		
24			NA		
					#1 Sand (19-30')
25					
26					
27					
28					
29					
30				Drilled to 30' bgs. End of boring at 30' bgs.	End Cap at 30'

WELL CONSTRUCTION

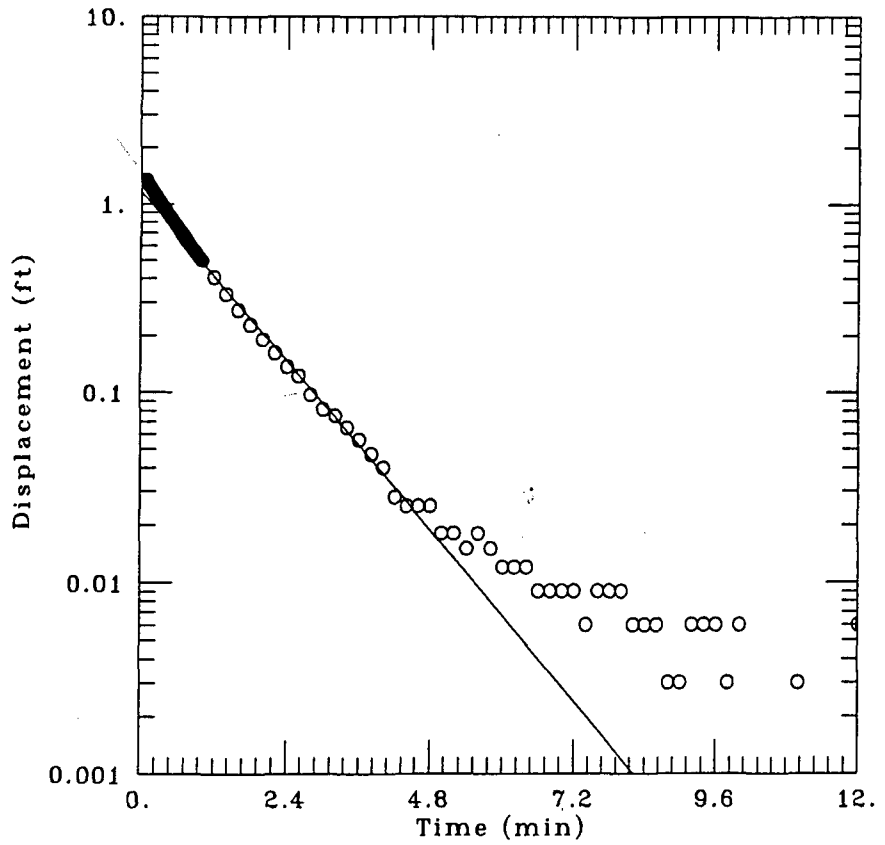


303842

APPENDIX I

HYDROGEOLOGICAL INFORMATION

MW-2 Slug Test



DATA SET:
s:mw2res2.dat
02/05/98

AQUIFER TYPE:
Unconfined

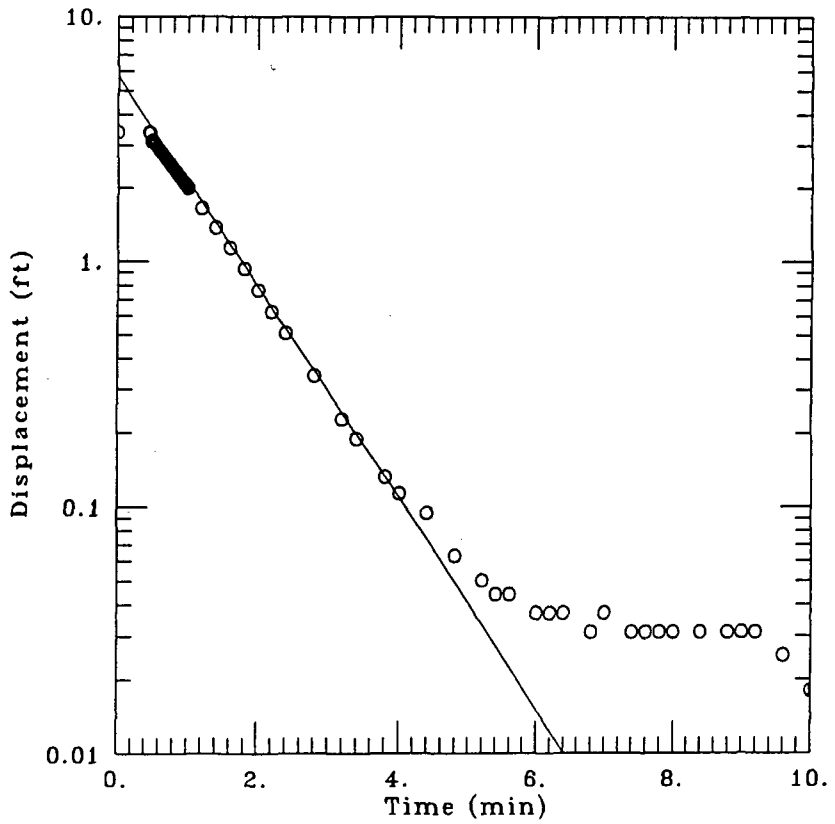
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.002043 ft/min
y0 = 1.155 ft

TEST DATA:
H0 = 1.347 ft
rc = 0.17 ft
rw = 0.42 ft
L = 10. ft
b = 75. ft
H = 5.27 ft

303844

MW-7 Falling Head Slug Test



DATA SET:
a:mw7a.dat
01/16/98

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

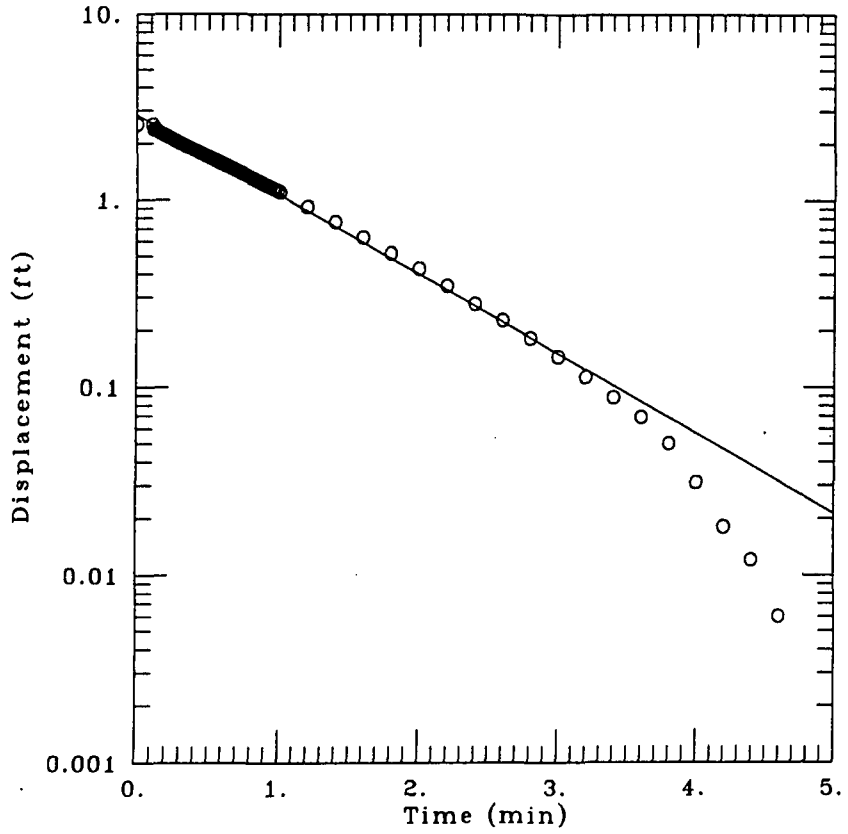
ESTIMATED PARAMETERS:
K = 0.004862 ft/min
y0 = 5.726 ft

TEST DATA:
H0 = 3.386 ft
rc = 0.167 ft
rw = 0.333 ft
L = 10. ft
b = 51.08 ft
H = 51.08 ft

303845

G:\STAFF\AGULAT\ICC\Slug Test\MW7FDRAW.wpd

MW-7 Rising Head Slug Test



DATA SET:
a: MW7B.DAT
05/12/98

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

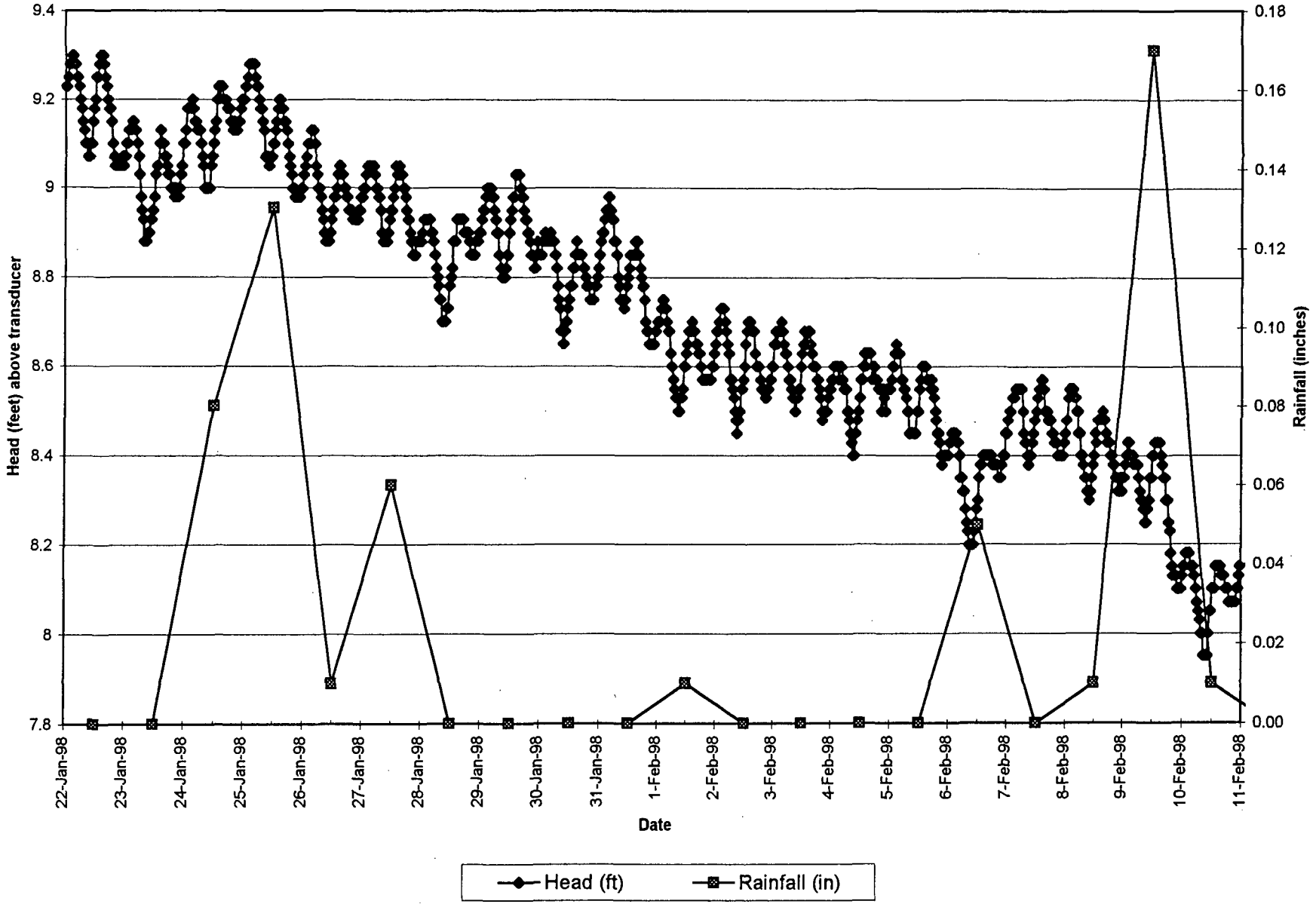
ESTIMATED PARAMETERS:
K = 0.004802 ft/min
y0 = 2.829 ft

TEST DATA:
H0 = 2.516 ft
rc = 0.167 ft
rw = 0.333 ft
L = 10. ft
b = 51.08 ft
H = 51.08 ft

303846

G:\STAFF\AGULAT\ICC\Slug Test\mw7rdraw.wpd

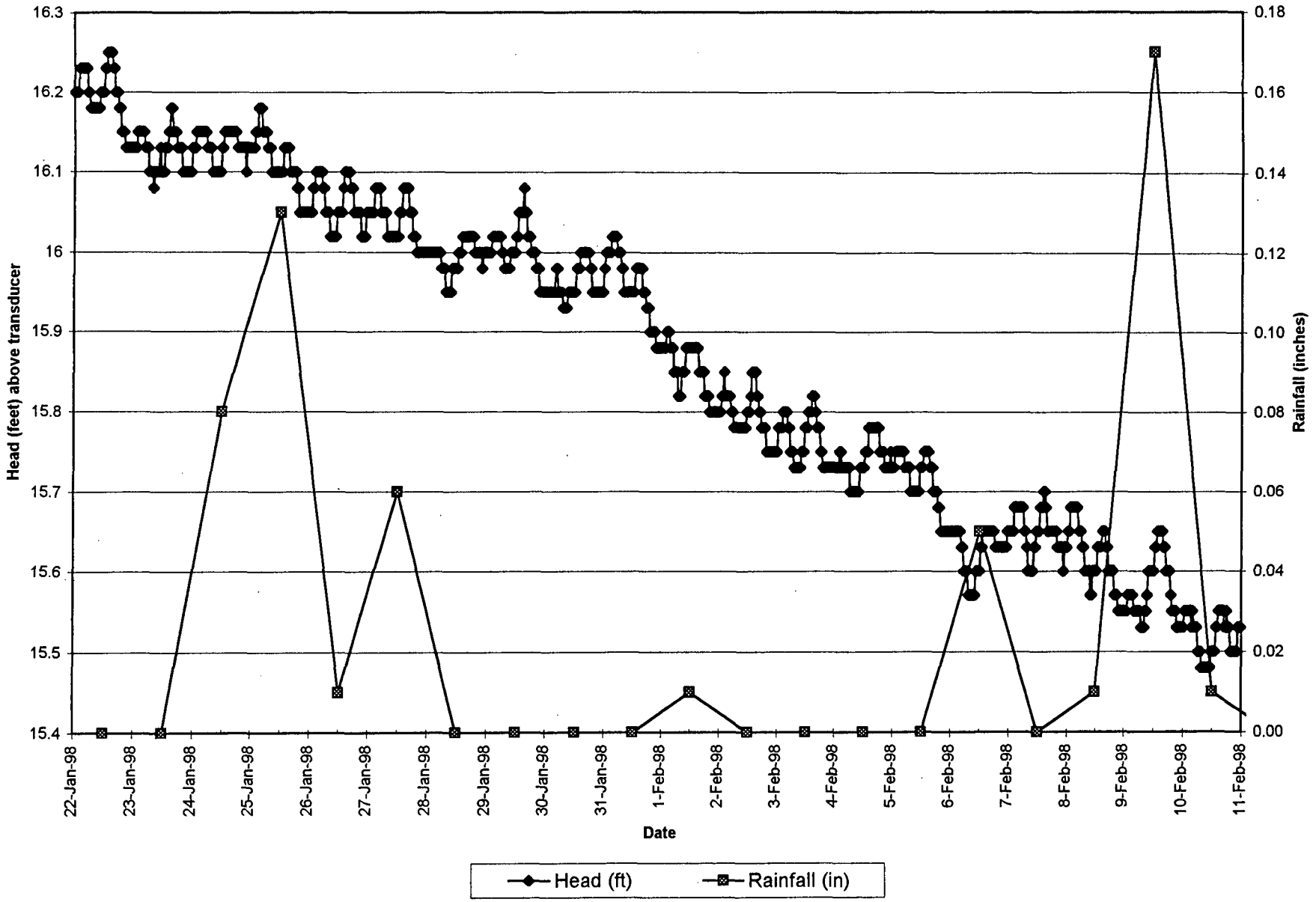
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH - MW-2
1/22/98 - 2/11/98



303847

MW - 2 - Jan-Mar 98 (Graph 2)

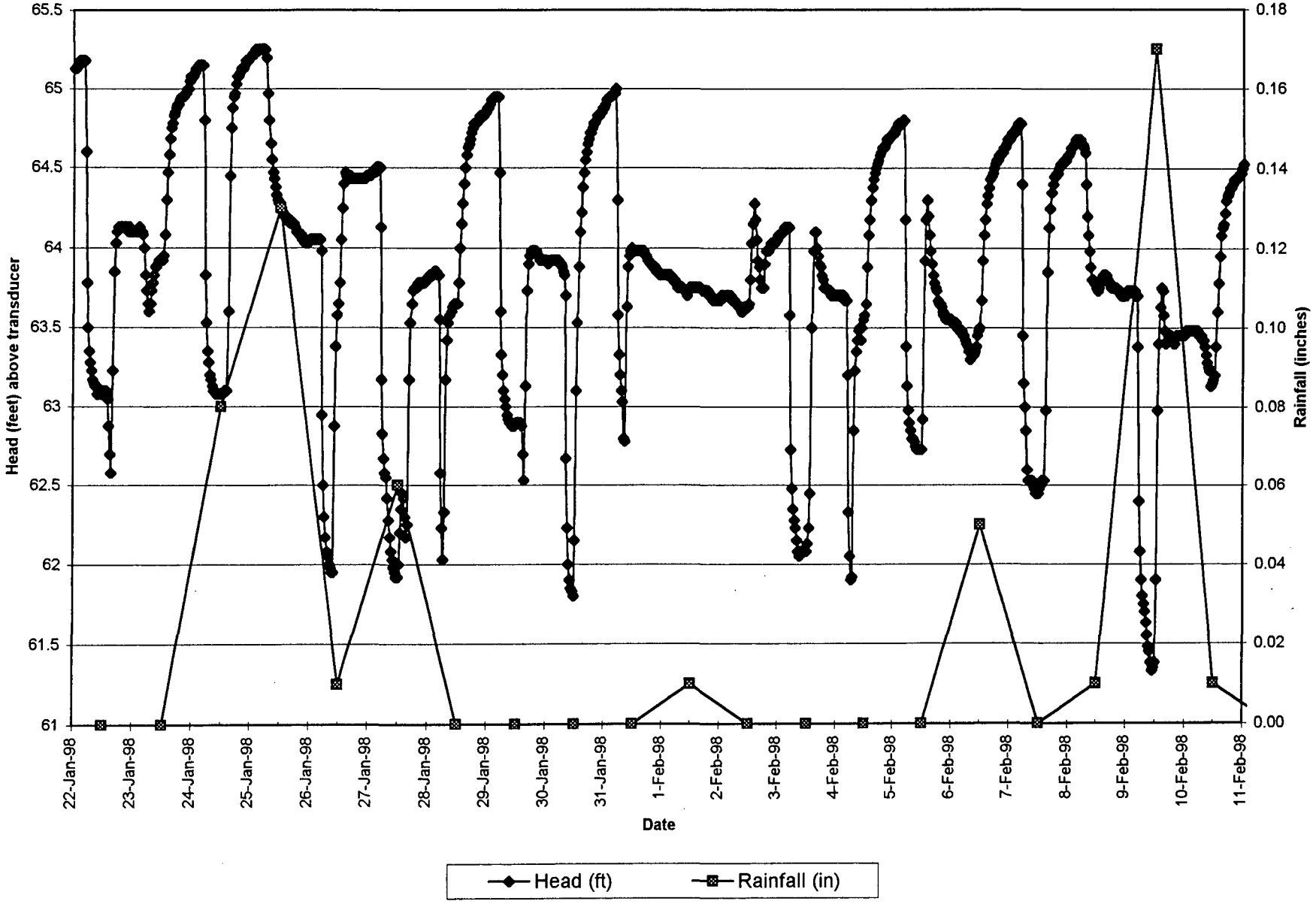
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH - MW-6
1/22/98 - 2/11/98



303848

MW-6 - Jan-Mar 98 (Graph 2)

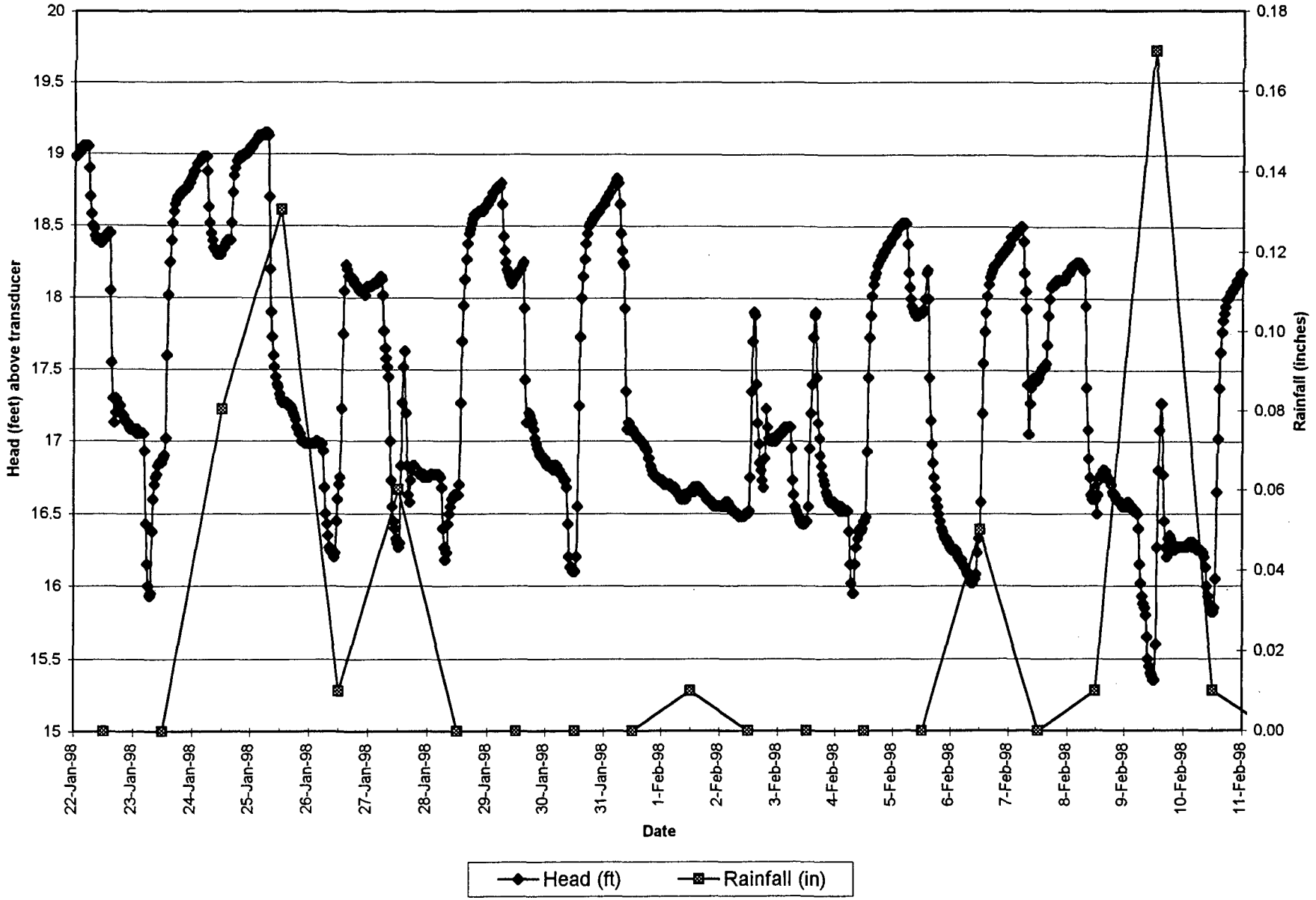
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH - MW-7
1/22/98 - 2/11/98



3033849

MW-7 - Jan-Mar 98 (Graph 2)

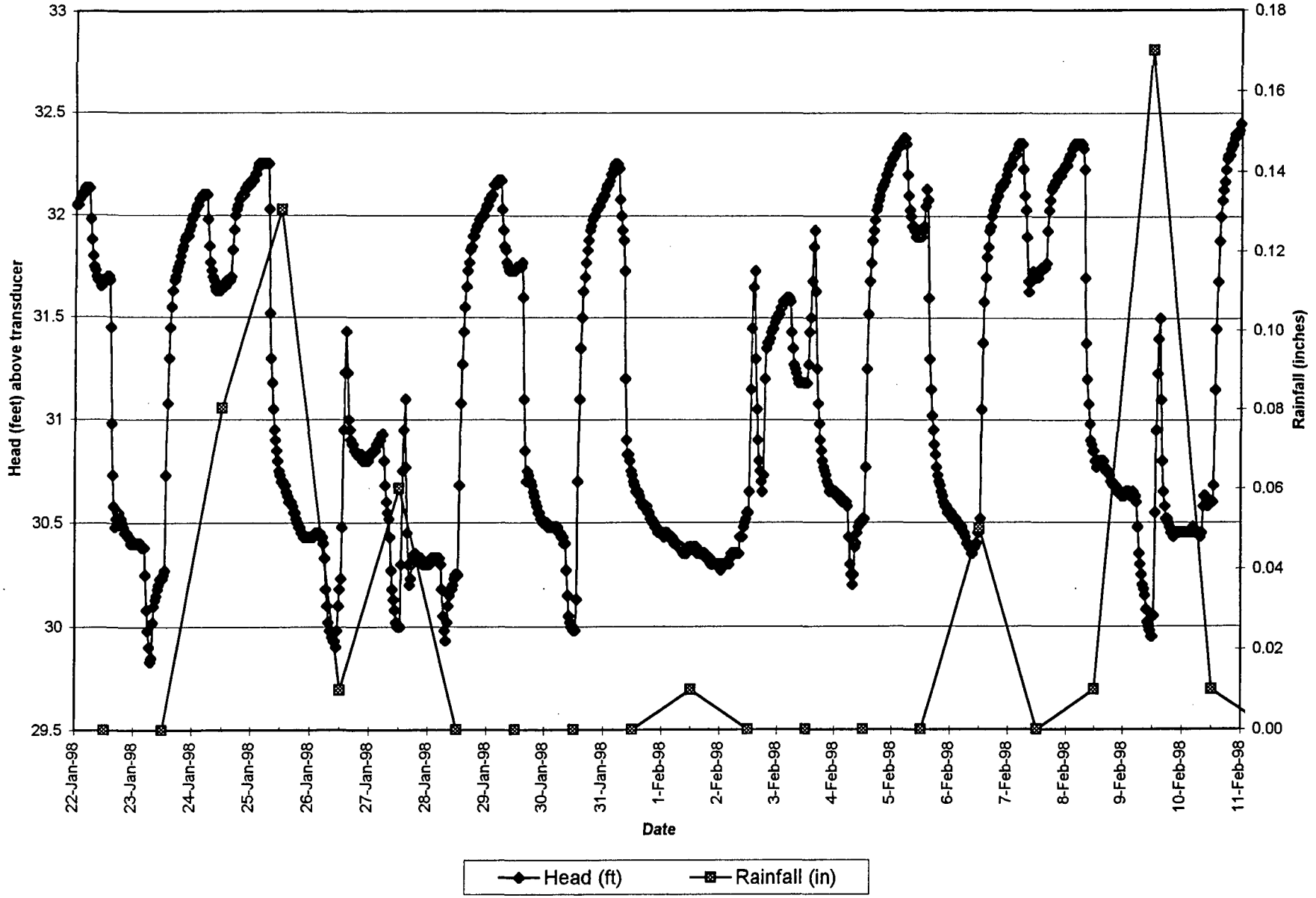
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH - MW-8
1/22/98 - 2/11/98



303850

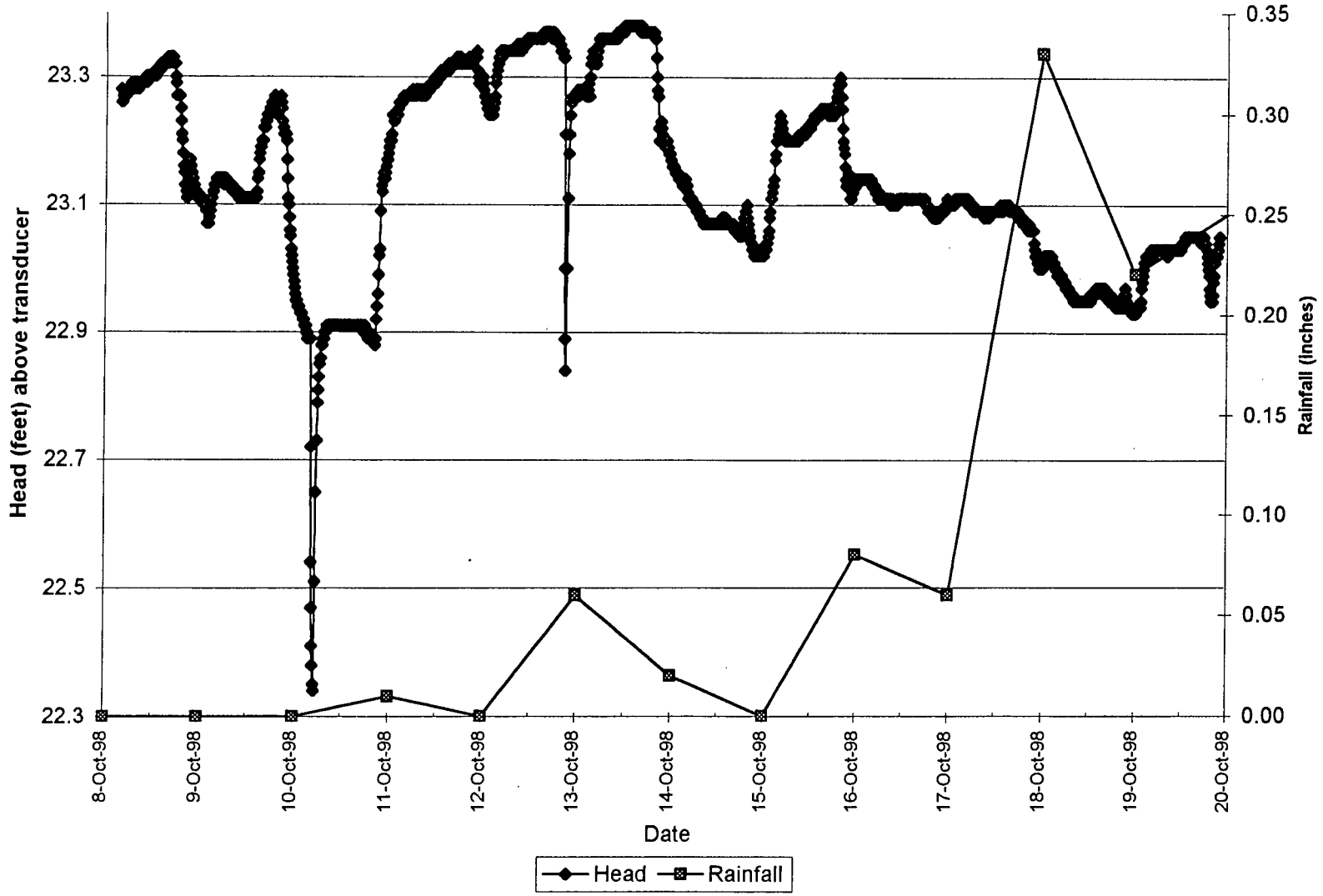
MW-8 - Jan-Mar 98 (Graph 2)

VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH - P-2
1/22/98 - 2/11/98



303851

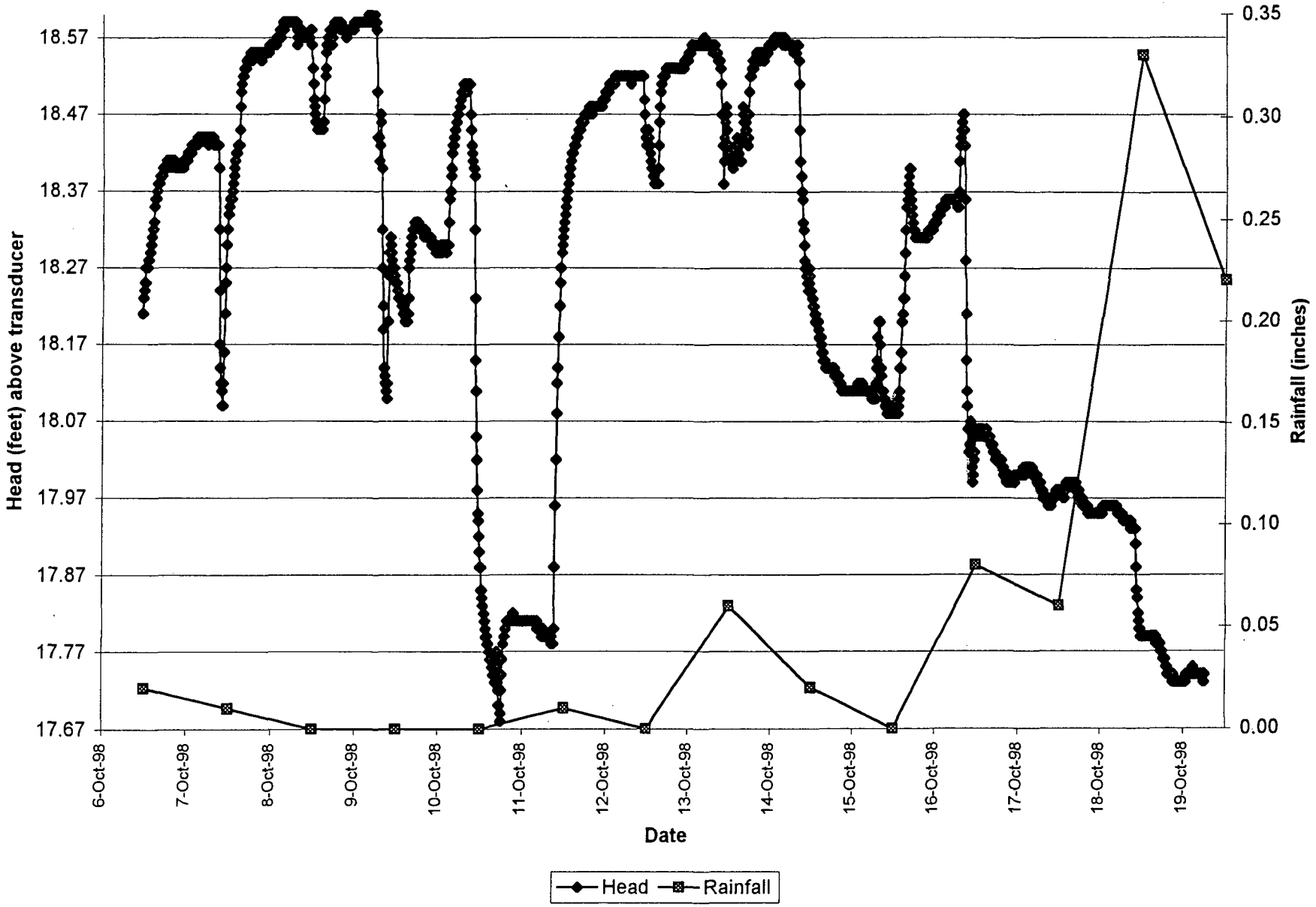
VIRGIN ISLAND[illegible]MICAL SITE
HYDROGRAPH, RAINFALL DATA - MW-7
10/8/98 - 10/20/98



303852

g:/staff/kroek/lcc/hydrographs/MW-7.xls

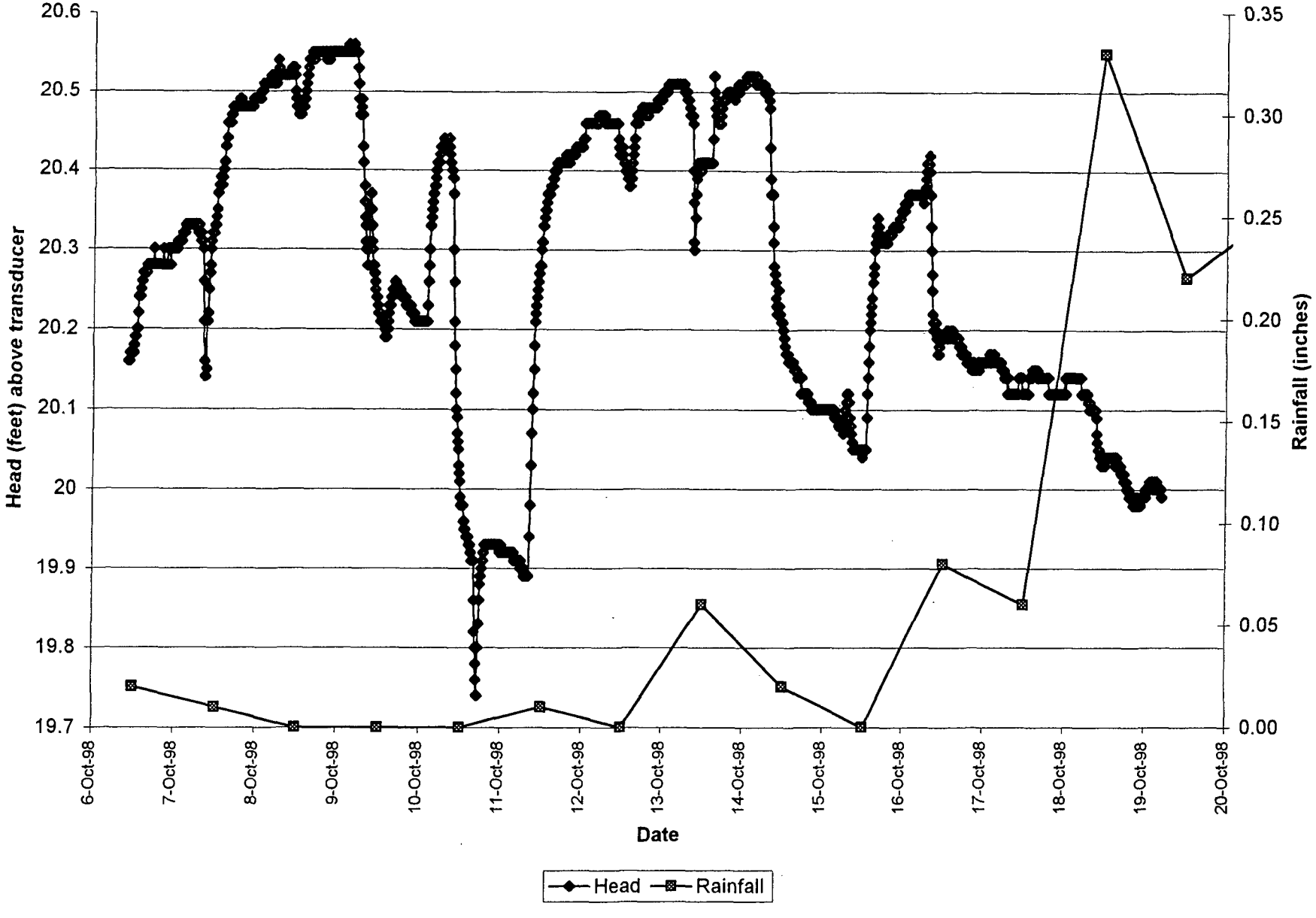
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH, RAINFALL DATA - MW-8
10/06/98 - 10/19/98



303853

g:/staff/kroek/lcc/hydrographs/MW-8.xls

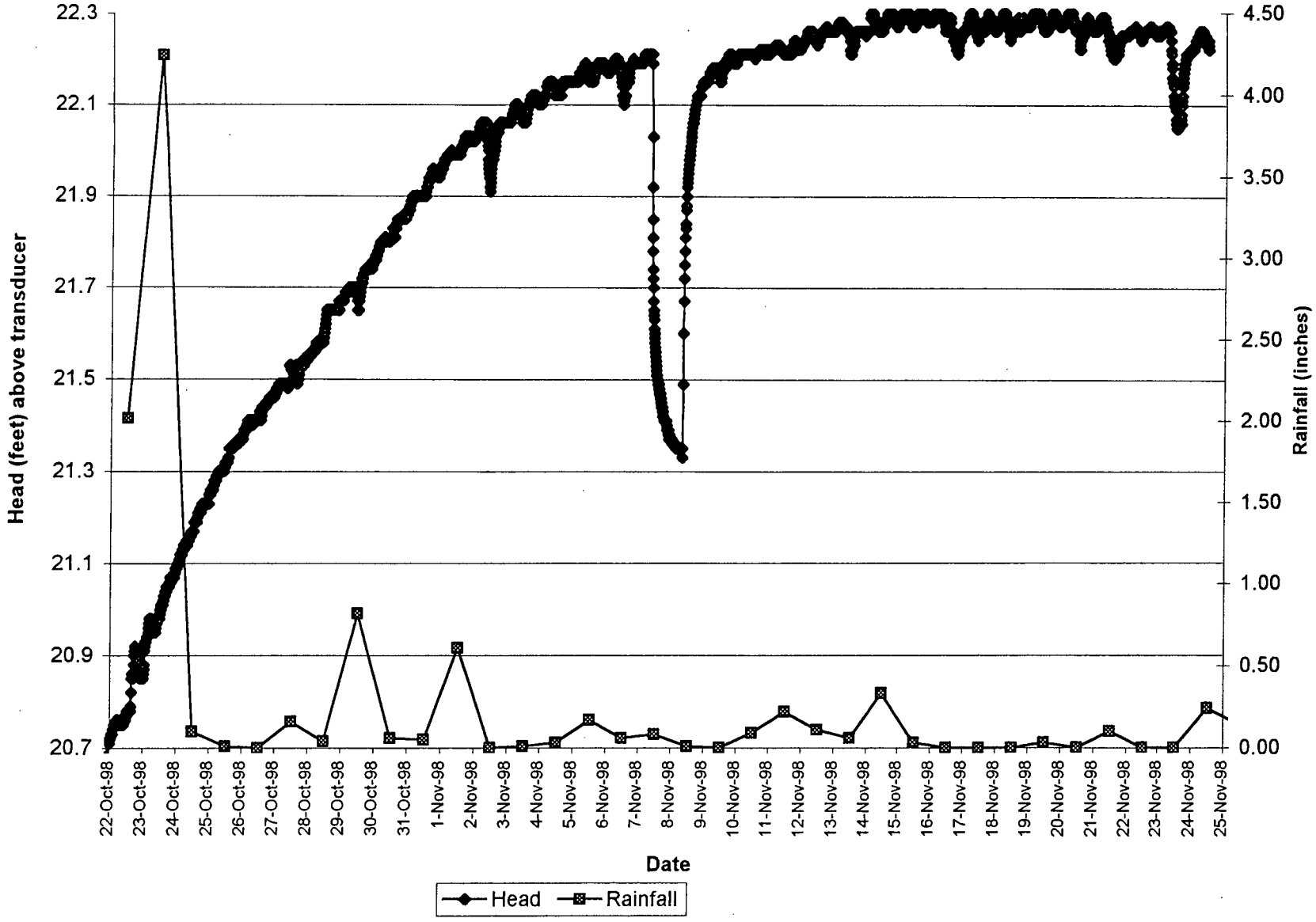
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH, RAINFALL DATA - MW-9
10/06/98 - 10/20/98



303854

g:/staff/kroek/lcc/hydrographs/MW-9.xls

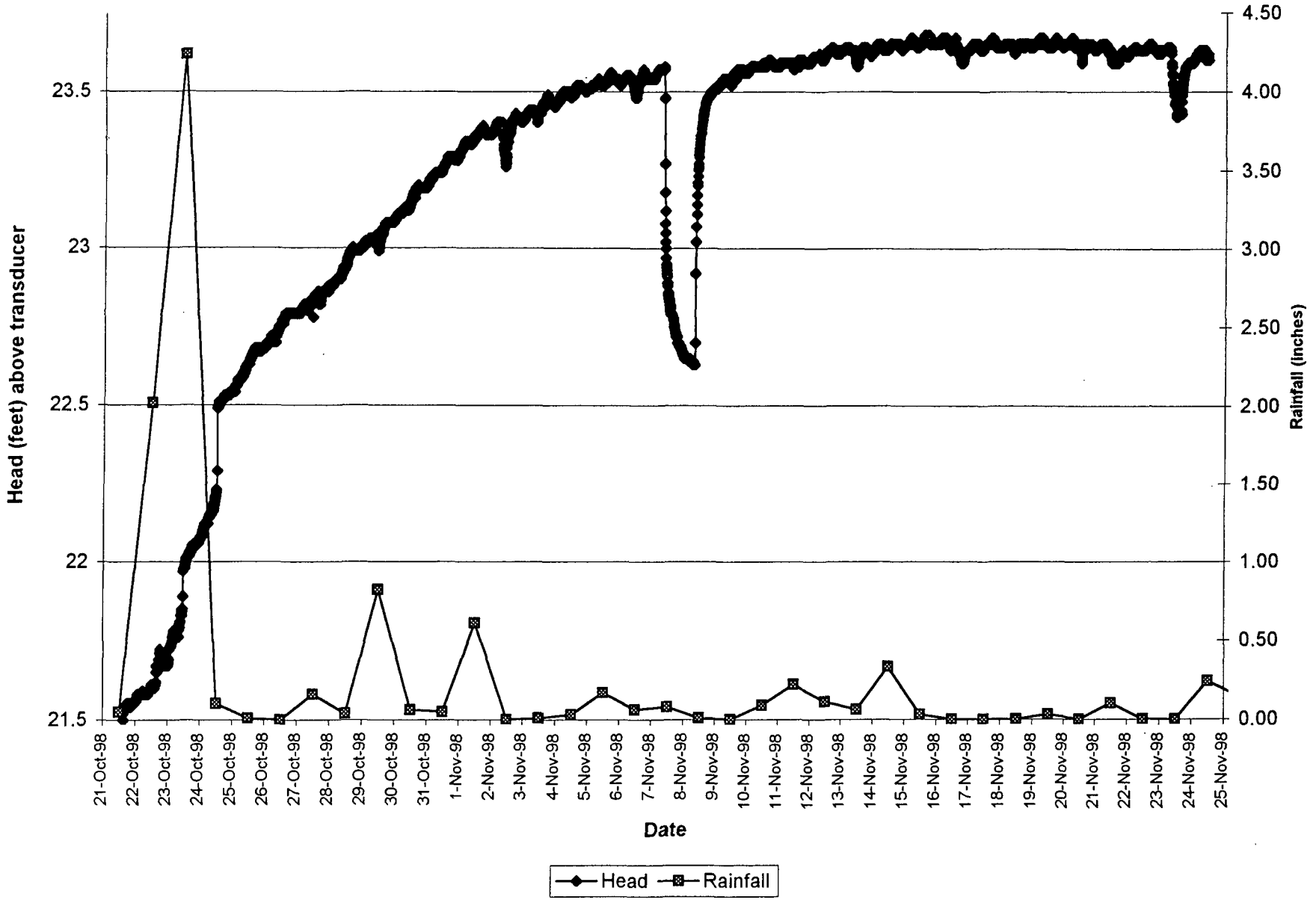
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH, RAINFALL DATA - MW-12
10/21/98 - 11/25/98



303855

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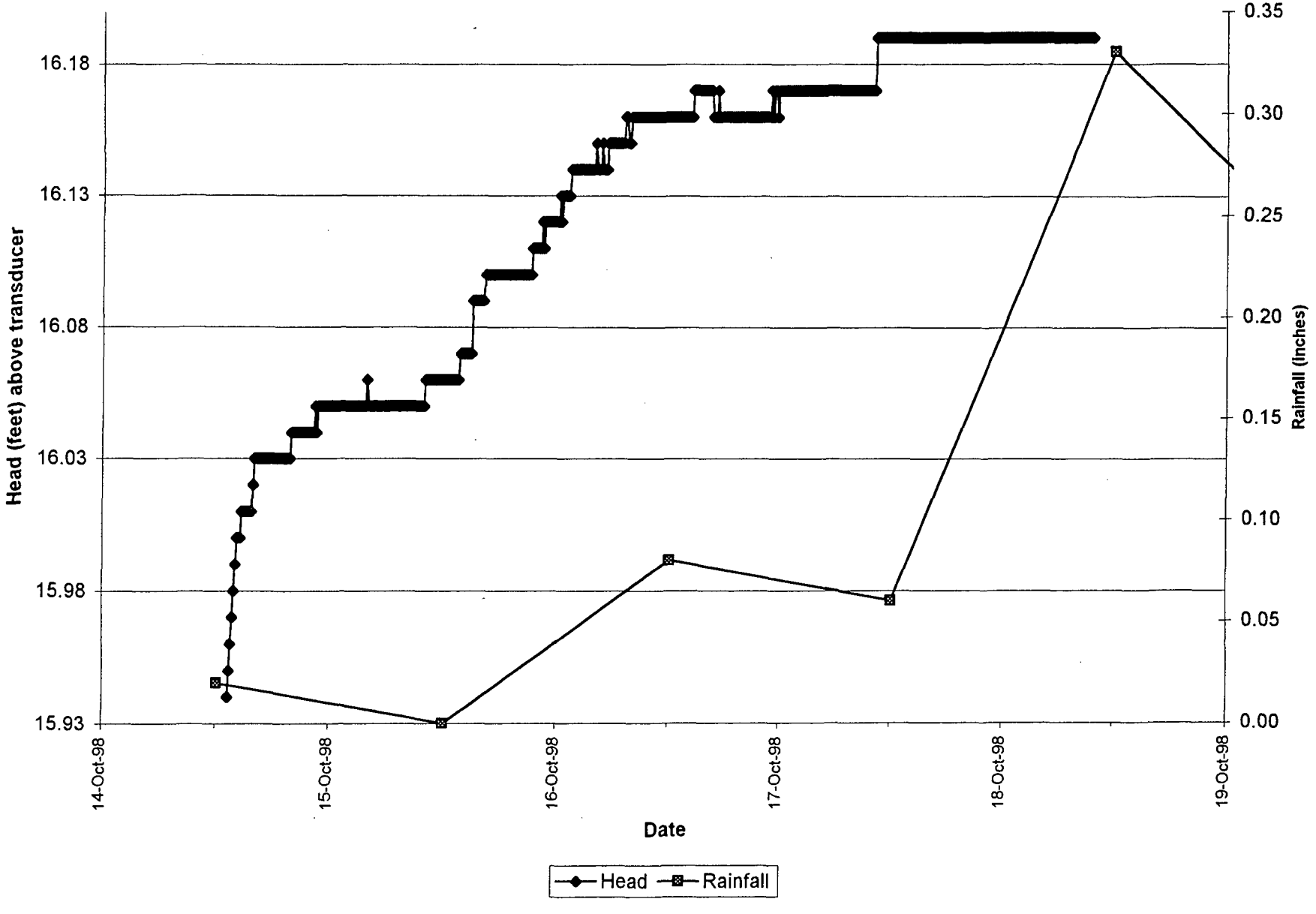
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH, RAINFALL DATA - MW-14
10/21/98 - 11/25/98



303856

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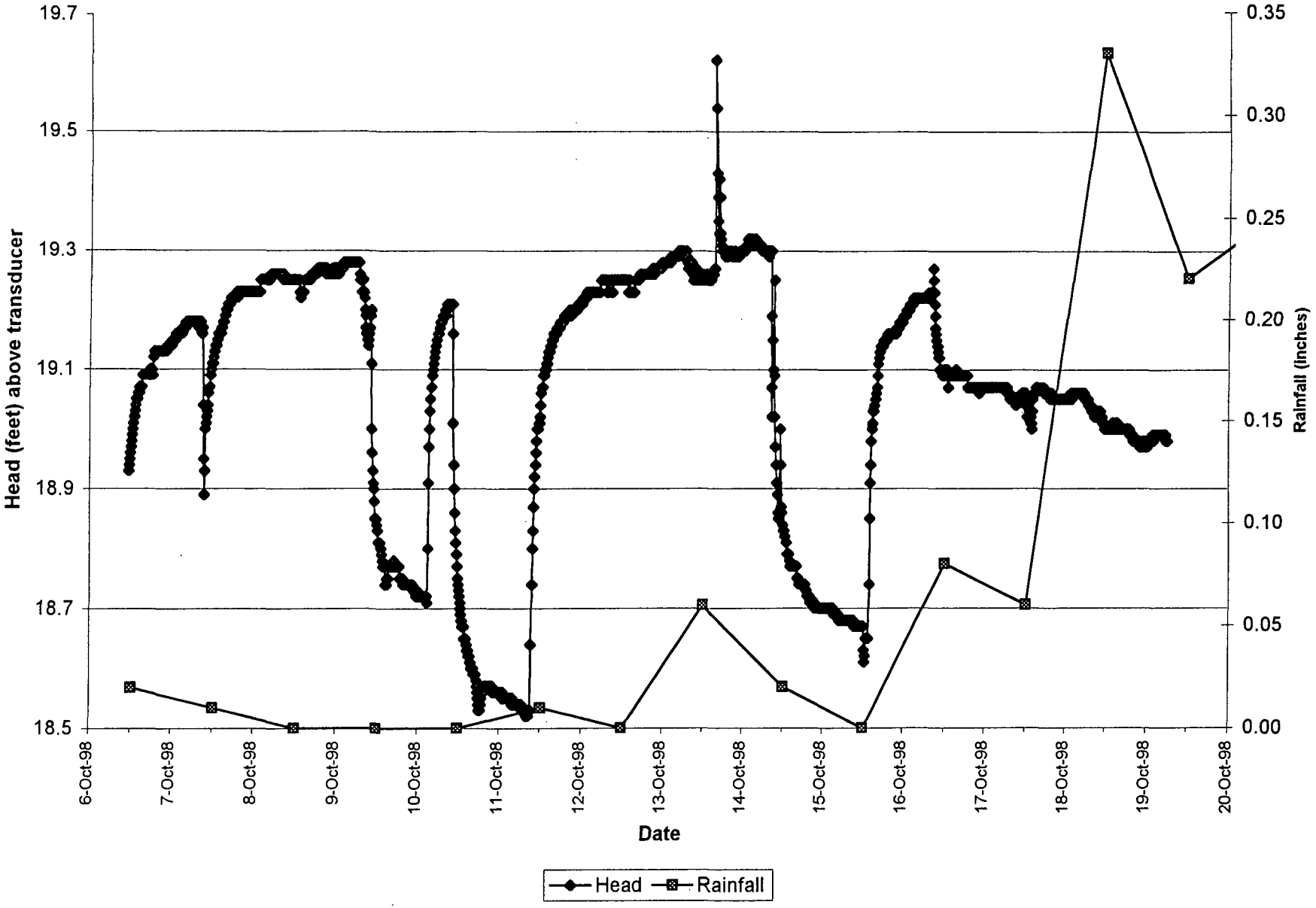
VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH, RAINFALL DATA - P-1
10/14/98 - 10/18/98



303857

g:/staff/kroek/lcc/hydrographs/P-1.xls

VIRGIN ISLAND CHEMICAL SITE
HYDROGRAPH, RAINFALL DATA - P-2
10/06/98 - 10/19/98



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J

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APPENDIX J

REVISED FINAL HUMAN HEALTH RISK ASSESSMENT

Virgin Island Chemical Site
St. Croix, U.S. Virgin Islands

Prepared for:

Berlex Laboratories, Inc.
15049 San Pablo Avenue
P.O. Box 4099
Richmond, CA 94804

and

Pharmacia & Upjohn
7171 Portage Road
Kalamazoo, MI 49001

October 2000

303860

REVISED FINAL

HUMAN HEALTH RISK ASSESSMENT

VIRGIN ISLAND CHEMICAL SITE
ST. CROIX, U.S. VIRGIN ISLANDS

OCTOBER 2000

303861

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10. 5a	Risk Assessment Summary, RME - *Resident, Child*
10. 5b	Risk Assessment Summary, CT - *Resident, Child*
10. 6a	Risk Assessment Summary, RME - *Resident, Adult + Child*
10. 6b	Risk Assessment Summary, CT - *Resident, Adult + Child*

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EXECUTIVE SUMMARY

A Human Health Risk Assessment (HHRA) was conducted for the Virgin Island Chemical (VICHEM) Site (the "VICHEM Site" or the "Site") located in St. Croix, U.S. Virgin Islands in accordance with the U.S. Environmental Protection Agency (EPA)-approved *Draft Remedial Investigation Work Plan* (Harding Lawson Associates [HLA] 1994), the Administrative Order on Consent (AOC) for the Site, and EPA risk assessment guidance documents including:

- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A - Interim Final* (EPA 5.6);
- *Guidance for Data Useability in Risk Assessments* (EPA 1990a);
- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A, Supplemental Guidance "Standard Default Exposure Factors"* (EPA 1991a);
- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals - Interim* (EPA 1991b);
- *Dermal Exposure Assessment: Principles and Applications* (EPA 1992a);
- *Supplemental Guidance to RAGS: Calculating the Concentration Term* (EPA 1992b);
- *Exposure Factors Handbook, Volumes I - III: General Factors - Review Draft* (EPA 1996a);
- *Exposure Factors Handbook, Volumes I-III: General Factors* (EPA, 1997b);
- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments - Interim* (EPA 1998); and
- Other federal or regional EPA documents, as appropriate.

The risk assessment was performed to provide an analysis of the potential Site-related health risks to human receptors to: (1) evaluate the need for future response actions; (2) provide a basis for assessing concentrations of hazardous substances that may remain onsite without adversely affecting human health; and (3) provide a basis for comparing potential health impacts of various remedial action alternatives and technologies.

CHEMICALS OF POTENTIAL CONCERN

The HHRA evaluated the potential human health risks associated with exposure to chemicals of potential concern (COPCs) detected in groundwater, soil, and soil/sediment samples that were collected during the four phases of the remedial investigation (RI). The maximum

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concentrations of constituents detected in these media were used in a screening process to develop a focused list of COPCs for evaluation in the risk assessment.

The following COPCs were identified for each of the media evaluated:

- *Groundwater (Onsite Monitoring/Production Wells)*

Acetone	Antimony
Chloroform	Arsenic
Ethylbenzene	Barium
Methylene chloride	Chromium (total)
Toluene	Iron
Xylenes	Lead
2,4-Dimethylphenol	Manganese
Isophorone	Vanadium
2-Methylphenol	

- *Groundwater (Offsite Production Wells)*

  No COPCs identified

- *Soil/Sediment in Gut System*

Aluminum	Iron
Arsenic	Manganese
Chromium (total)	Vanadium

- *Surface Soil*

Arsenic	Manganese
Chromium (total)	Vanadium
Iron	Zinc

- *Subsurface Soil*

  No COPCs identified

No COPCs were identified for direct contact with subsurface soil at the Site. Consequently, no potential health risks are identified for the inhalation, ingestion, or dermal contact of constituents detected in this medium under a current or future land use scenario. In addition to evaluating the potential for risk associated with direct contact of constituents in subsurface soil, the same data were also compared to EPA's Soil Screening Levels (SSLs) to determine if concentrations could adversely impact groundwater through leaching. Pentachlorophenol and isophorone were the only constituents detected above their respective SSLs, however, pentachlorophenol was only

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detected once above the SSL and was not detected in groundwater. This evaluation is discussed in detail in Section 4.0 of the RI Report.

The following constituents were detected at concentrations above the criteria:, ethylbenzene, and total xylenes. Although the maximum concentration of chloroform (410 parts per billion [ppb]) did not exceed the SSL of 600 ppb, this constituent was included as a COPC for the purposes of this evaluation. Additionally, although acetone and methylene chloride detections in subsurface soil were attributed to blank contamination and should not be considered present in this medium, these two constituents were retained as COPCs for the purpose of this evaluation. Two inorganics also were found at concentrations above the SSLs. Cadmium was detected in one sample at 10.1 parts per million (ppm), slightly above the SSL of 8 ppm, and cyanide was detected in three samples ranging in concentration from 47.3 to 60.2 ppm, exceeding the SSL of 40 ppm (based upon a DAF of 20). Cyanide exceeded the SSL (20 DAF) in three of eighteen samples. One sample was validated and detected at a concentration of 51.7 ppm. In one additional subsurface soil boring, at two different depths, cyanide was estimated and qualified with "spike recovery not within control limit" (concentrations = 47.3 ppm and 60.2 ppm). For comparison purposes, an average of cyanide concentrations in site subsurface soil results in a concentration of 9.3 ppm, which is below the SSL. Additionally, cyanide was not detected in any other site media, including groundwater. It should also be noted that a comparison with direct contact risk-based values was performed for cyanide. The Region III RBC for soil ingestion based upon a residential scenario is 160 mg/kg. The direct contact SSL for soil ingestion is 1,600 mg/kg. None of the cyanide concentrations detected exceed these risk-based values. The soil to groundwater and direct contact SSLs were used as a comparison level for cyanide, however, as cyanide is rarely encountered at the site, was not detected in groundwater, and was not used in historical site processes, it was not retained as a COPC in this HHRA.

Likewise, although cadmium was detected across most of the Site, it was only found at a concentration slightly above the SSL at one location; hence, it is not considered a COPC. Therefore, subsurface soil is considered a medium of concern regarding the potential for impact to groundwater and the following constituents are noted as COPCs for the Site: chloroform, ethylbenzene, and total xylenes. As expected, this list of constituents is consistent with the VOCs presented in the list of COPCs identified for onsite groundwater.

EXPOSURE PATHWAYS AND POTENTIALLY-EXPOSED POPULATIONS

The potential exposure pathways of ingestion, inhalation, and dermal absorption via contact with the COPCs in groundwater, soils, and sediments were evaluated for completeness. For an exposure pathway to be complete, it must have four elements: (1) a source and mechanism for chemical release; (2) an environmental transport medium (*e.g.*, air, water, soil); (3) a point of potential human contact with the medium; and (4) a route of uptake for the chemical at the contact point (*e.g.*, inhalation, ingestion, dermal contact).

Considering the current and future anticipated land use scenarios proposed for the VICHEM Site (*i.e.*, industrial), several exposure pathways were identified for evaluation. Potential human

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receptor populations were evaluated for each pathway and either ruled out or included in the risk assessment. This evaluation identified the following possible exposure pathways:

- *Current Land Use*

  - Residential (child/adult) exposure to groundwater via six offsite wells was considered. No COPCs were identified for the groundwater collected from these offsite wells in the immediate vicinity of the Site; therefore, current residential exposure to groundwater was not evaluated further.

  - Trespasser (pre-adolescent/adult) exposure to COPCs in surface soil/sediment collected from the Site and the Gut System was evaluated. Exposure to COPCs via incidental ingestion, dermal contact, and inhalation of particulates was evaluated for these receptors.

- *Future Land Use*

  - Industrial/commercial (adult) exposure was considered for future industrial use of the Site. This pathway examined exposure to COPCs in groundwater, surface soil, and sediment via ingestion, inhalation of VOCs (groundwater) and particulates (soil and sediment), and dermal contact.

  - Construction at the Site was considered to be a plausible future exposure scenario. This pathway evaluated the adult construction worker's exposure to COPCs in surface soil, subsurface soil (up to 12 feet below ground surface [ft bgs]), and soil/sediment in the Gut System via incidental ingestion, dermal contact, and inhalation of particulates. Exposure to groundwater was not evaluated for this receptor since groundwater at the Site is generally encountered at depths between 18 and 20 feet bgs. Since construction activities are not anticipated to occur at such depths, exposure to groundwater was not considered. In addition, although subsurface soil was examined for this receptor, no COPCs were identified in this medium and no risk estimates were developed. In addition to evaluating the potential for risk associated with direct contact of constituents in subsurface soil, the same data also was compared to EPA's SSLs to determine if concentrations could adversely impact groundwater through migration (leaching). The results of this evaluation are discussed in Section 4.0 of the RI Report.

  - An offsite residential scenario was evaluated for potential future exposure to COPCs in groundwater. Currently, there are no COPCs in the offsite wells. However, EPA and VIDPNR have raised concerns regarding the uncertainties associated with future land use/development in the vicinity of the Site and the potential for COPCs in onsite groundwater to migrate offsite. Therefore, future exposure to COPCs in groundwater via ingestion, inhalation, and dermal contact was quantified for an adult and child resident. Specifically, a future adult and child resident were evaluated for potential exposure to COPCs in groundwater via ingestion of well water, dermal contact while showering/bathing, and inhalation of VOCs while showering/bathing.

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HEALTH RISK ESTIMATE

Based on the identification of sources, pathways, and receptors, estimates of human health risk were developed for exposure of the above-noted receptor populations to COPCs in media associated with complete or hypothetically-complete exposure pathways. Estimates of human uptake were calculated using the 95th upper confidence limit (95th UCL) of lognormally transformed datasets or maximum detected concentrations in any instance where the UCL exceeded the maximum. The estimated carcinogenic risks and non-carcinogenic hazards were compared to EPA guidelines and generally-accepted target risk levels. Carcinogenic risks falling within the target range of 1 x 10^{-6} to 1 x 10^{-4} and non-carcinogenic hazards less than 1 were considered to be acceptable.

The result of this evaluation concluded that most of the chemicals detected in groundwater, soil, and sediment are not associated with an excess health risk for the current or future land use scenarios evaluated. Tables 9.1 through 9.7 present the non carcinogenic and carcinogenic hazard and risk estimates for the exposure pathways evaluated.

Current Land Use

Based on the inactive status of the VICHEM Site, current land use scenarios evaluated exposure to onsite surface soil and soil/sediment in the Gut System for an adult and pre-adolescent trespasser. The cancer risk estimates presented are associated with exposure to arsenic and chromium, which are the only carcinogenic COPCs identified in onsite surface soil and soil/sediment in the Gut System. In addition to these two constituents, noncancer hazards were evaluated for iron (surface soil and soil/sediment) and manganese (surface soil). These risk estimates are discussed below and presented in Tables 9.1 and 9.2.

Adult Trespasser

For the adult trespasser, RME to COPCs in surface soil resulted in a carcinogenic risk estimate (total of all pathways) of 1 x 10^{-6}, which equals the lower end of EPA's benchmark range. This receptor's exposure to COPCs detected in the soil/sediment in the Gut System are below EPA's target risk at 3 x 10^{-7}. The cumulative risk for this receptor (total of all pathways and media) is 1 x 10^{-6} which equals the 10^{-6} carcinogenic risk benchmark. The CT carcinogenic risks were calculated for surface soil and the CT risk of 1 x 10^{-7} is below the EPA benchmark.

Noncancer hazard estimates for the RME receptor were less than the target level of 1 for exposure to COPCs in onsite surface soil and soil/sediment in the Gut System with an overall cumulative HI of 7.7E-02. Because the RME noncancer HIs were less than 1, the CT receptor was not evaluated.

Pre-Adolescent Trespasser

None of the individual pathway (*i.e.*, ingestion, dermal contact, and inhalation) risk estimates nor the cumulative RME risk estimate of 5 x 10^{-7} associated with exposure to onsite surface soil

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evaluated for the pre-adolescent trespasser exceed EPA's 10^{-6} point of departure for acceptable carcinogenic risk. Carcinogenic risk estimates calculated for exposure to COPCs in soil/sediment in the Gut System were less than EPA's benchmark of 10^{-6} at 1×10^{-7}. The pre-adolescent trespasser's overall cancer risk estimate (contact with COPCs in onsite surface soil and Gut System soil/sediment via ingestion, inhalation, and dermal pathways) is 7×10^{-7} which is less than 10^{-6}. It was not necessary to evaluate the CT receptor for this scenario.

Individual noncancer hazard estimates were less than the target level of 1 for pre-adolescent trespasser exposure to COPCs in onsite surface soil and soil/sediment in the Gut System. As presented in Table 9.2, the overall HI across all media and exposure routes is 2.4E-01. It was not necessary to evaluate the CT receptor for this scenario.

Future Land Use

Considering the current and anticipated future industrial zoning classification of the VICHEM Site, future land use scenarios evaluated exposure to COPCs in groundwater, surface soil, and soil/sediment in the Gut System for an adult industrial/commercial worker. In addition, a future construction scenario was evaluated for direct contact exposure with COPCs in surface soil. Subsurface soil was not evaluated for the construction worker because no COPCs were identified in this medium. However, the potential risk associated with leaching of constituents via groundwater migration through subsurface soil was evaluated by comparing concentrations to EPA's SSLs. The results of this evaluation are discussed in Section 4.0 of the RI Report. Finally, an offsite resident was evaluated for direct contact (dermal contact, ingestion) with COPCs and inhalation of volatile COPCs in groundwater.

Exposure to groundwater was evaluated for the onsite industrial worker, assuming this receptor would use groundwater from an onsite well for potable and non-potable purposes. The pathways evaluated for exposure to COPCs in groundwater included ingestion, dermal contact, and inhalation of VOCs. Offsite residential exposure to groundwater was evaluated based on the future potential for COPCs in onsite groundwater to migrate to offsite wells. The pathways evaluated include exposure to COPCs in groundwater via ingestion of groundwater from the tap, and dermal contact and inhalation while showering (adult) or taking a bath (child). For the purpose of this HHRA, it was assumed that current onsite groundwater concentrations were representative of future offsite concentrations. The probability that groundwater concentrations will be the same offsite as they are onsite is uncertain, as the concentrations offsite will likely be affected by many chemical-specific factors such as natural attenuation, degradation, and mobility. However, this assumption was made for the purposes of this risk assessment. A discussion on environmental fate and transport as it relates to this HHRA is presented in the Qualitative Uncertainty Section 5.6.2. As previously discussed, exposure to groundwater was not considered for the construction worker.

Like current land use scenarios, the cancer risk estimates presented for surface soil and soil/sediment in the Gut System are associated with exposure to arsenic and chromium which are the only carcinogenic COPCs identified in these media. In addition, noncancer hazards were evaluated for aluminum (soil/sediment), iron (surface soil and soil/sediment), manganese

(surface soil and soil/sediment), vanadium (surface soil and soil/sediment), and zinc (surface soil). These risk estimates are discussed below and presented in Tables 9.3 and 9.4.

Industrial/Commercial Worker

The hypothetical industrial/commercial worker receptor was evaluated for potential risk associated with exposure to COPCs in groundwater, surface soil, and soil/sediment collected in the Gut System. The cumulative RME risk estimate of 9×10^{-4} exceeds the target range of 1×10^{-6} to 1×10^{-4}. The majority of the potential carcinogenic risk is associated with exposure to COPCs in groundwater as shown in Table 9.3a. In particular, inhalation of volatilized chloroform, exposure to chloroform and arsenic via ingestion, and dermal contact with chloroform account for most of the cumulative risk estimate for this medium. Onsite surface soil exposures for the RME scenario exceed the lower end of EPA's target range with estimates of 3×10^{-6}. Exposure to the Gut System soil/sediment yielded a risk estimate of 6×10^{-7}, less than the EPA benchmark risk estimate. The carcinogenic risks from these media are associated with arsenic.

CT risk estimates for the industrial onsite worker are greater than the high end of EPA's acceptable target risk range. The cumulative risk estimate for this receptor is 2×10^{-4} which, like the RME, is comprised almost entirely of risk associated with exposure to COPCs in groundwater. Again, inhalation of volatilized chloroform contributes essentially all of this risk with an associated cancer risk estimate of 2×10^{-4}. Surface soil risk estimates for the CT receptor did not contribute significantly with a cumulative pathway risk estimate of 5×10^{-7}.

For the RME receptor, the only noncarcinogenic hazards exceeding 1 are associated with exposure to COPCs in groundwater. The majority of this hazard estimate is associated with inhalation of volatilized chloroform with a HQ of 3.3E+02. The cumulative ingestion HQs associated with groundwater yield a hazard quotient of 2.7E+00. Target organ HIs across all media are 3.3E+02 for liver/kidney, 5.8E-02 for decreased hair proteins, 7.3E-02 for skin, 1.2E+00 for Central Nervous System (CNS), 1.0E-01 for blood effects, 5.8E-01 for liver/heart/pancreas, 7.1E-02 for lung effects, and 6.1E-.3 for Gastrointestinal (GI) tract. The cumulative HI associated with exposure to groundwater is 3.3E+02 (99% of which is associated with inhalation of volatiles in groundwater).

Evaluation of the CT receptor provided similar results as the RME (cumulative groundwater HI values greater than 1) since inhalation of chloroform is responsible for most of the non-carcinogenic risk and inhalation rates were not varied between the two receptors.

Since RME exposures to surface soil and soil/sediment in the Gut System did not generate non-carcinogenic hazard estimates greater than the target benchmark, CT receptors to these media were not evaluated. Risk estimates for the RME receptor are presented in Table 9.3a showing HI of 3.1E-01 for surface soil and 6.1E-02 for soil/sediment.

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Construction Worker

The total risk estimate associated with exposure to arsenic in surface soil and soil/sediment for the construction worker (9×10^{-7}) is less than EPA's 10^{-6} target risk. This result indicates no significant risk for this receptor under the future construction scenario evaluated. Direct contact exposure to subsurface soil was not evaluated since there were no COPCs identified in this medium.

Ingestion non-cacinogenic hazard estimates for the RME construction worker were slightly greater than one for ingestion of onsite surface soils (1.2E+00). Across all media no individual COPC was greater than one, but the cumulative HI was 1.8E+00, indicating a slight potential for adverse health effects. The total CT HI was 2.5E-01.

Adult Resident

The adult offsite resident was evaluated for potential risk associated with exposure to COPCs in groundwater. The cumulative RME risk estimate, 8×10^{-4}, exceeds the EPA target risk range of 1×10^{-4} to 1×10^{-6}. The majority of the potential risk comes from chloroform via ingestion and inhalation, and arsenic via the ingestion pathway. The CT estimate for this scenario is 9×10^{-5}, and falls within the EPA benchmark risk range.

For the non-carcinogenic evaluation, the cumulative RME hazard of 2.5E+02 exceeded the acceptable level of 1. Exposure via inhalation and ingestion contributed to the majority of the hazard. Specifically, individual HIs for inhalation of chloroform (2.5E+02) and the ingestion of chloroform (2.8E+00), iron (1.1E+00), and manganese (2.7E+00) in groundwater all exceeded 1. Target pathway HIs exceeding 1 included liver/kidney (2.5E+02), CNS, (2.8E+00), and liver/heart/pancreas (1.2E+00).

The cumulative CT hazard across groundwater is 8.2E+01, to which chloroform (1.7E+00) and manganese (1.5E+00) each contributed via the ingestion pathway, and chloroform contributed the majority via inhalation (7.8E+01).

Risk and hazard estimates for the adult resident are presented in Tables 9.5a and 9.5b.

Child Resident

The child offsite resident risk estimate, 4×10^{-4}, exceeds the EPA target risk range. Major contributing COPCs were similar to those for the adult scenario. The CT risk estimate was also calculated, and just fell within the EPA target risk range at 1×10^{-4}.

For the non-carcinogenic evaluation, the total HI RME estimate was 6.0E+02. COPCs contributing to the majority of hazard were chloroform via ingestion (8.3E+00) and inhalation (5.8E+02), manganese via ingestion (7.7E+00), and iron via ingestion (3.2E+00). Pathway-specific HIs that exceeded one included liver/kidney (5.9E+02), CNS (8.0E+00) and liver/heart/pancreas (3.3E+00). The total HI CT estimate was 2.0E+02.

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Addition of the Adult and Child Resident

EPA guidance (1989) recommends that adult and child carcinogenic risk-estimates are combined to derive an overall lifetime cancer risk. As presented above, the total risk estimates for both the child and adult-exceeded EPA's target risk range, in most cases. The cancer risks for the adult and child resident were summed using the data presented in Tables 8.19a, 8.20a, 8.21a and 8.22a (RME) and 8.19b, 8.20b, 8.21b, and 8-22b (CT). The cumulative risk for the adult and child resident under an RME scenario is 1×10^{-3} and under the CT scenario is 2×10^{-4}. The driving pathways and chemicals are consistent with the adult and child risk estimates. The summary of these risks are presented in Tables 9.7a and b.

RISK CHARACTERIZATION SUMMARY

As previously discussed, based on the exposure assumptions utilized in developing risk estimates, the hypothetical industrial/commercial occupational exposure to groundwater under a future land use scenario is the only on-Site pathway that presents cumulative risk estimates, for both the RME and CT receptors, in excess of EPA's target acceptable range. Concentrations of chloroform in groundwater are responsible for the majority of this risk.

Onsite surface soil and soil/sediment in the Gut System demonstrated carcinogenic risks for the adult industrial worker in excess of 10^{-6} for ingestion at 3×10^{-6}; however, this risk estimate is within EPA's acceptable range of 10^{-6} to 10^{-4}. This risk was associated primarily with ingestion of arsenic in soils.

Estimated risks for adult and pre-adolescent trespassers and construction workers are at or below the EPA target of 10^{-6} risk.

The RME risk estimates for potential future residential groundwater use exceeded the EPA range for adult and child receptors. For both residential scenarios, the COPCs which contributed to the majority of risk are chloroform and arsenic. Both adult and child residential RME HIs exceeded 1 (2.5E+02 and 6.0E+02, respectively). Ingestion and inhalation of chloroform contributed to the majority of the risk and hazard for the residential groundwater use scenario. Ingestion of arsenic, iron, and manganese also contributed to the risk and hazard estimates.

In summary, based on the scenarios evaluated for future land use, the chemical which is the main driver of hazard and risk at the site is chloroform in groundwater. Chloroform in groundwater is the main risk driver for the industrial/commercial worker and the residential adult and child. Other hazard drivers include manganese and iron in groundwater (industrial/commercial and adult and child residential), and iron in surface soil and soil/sediment in the Gut System (construction worker). A summary of the risk drivers is presented in Tables 10.1 through 10.6b.

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1.0 INTRODUCTION

A Human Health Risk Assessment (HHRA) was conducted for the Virgin Island Chemical (VICHEM) Site (the "VICHEM Site" or the "Site") located in St. Croix, U.S. Virgin Islands. The HHRA assesses the potential for adverse health effects that may be associated with exposure to constituents in Site groundwater, surface and subsurface soil, and soil/sediment located in the Gut System adjacent to the Site.

The risk assessment was performed to provide an analysis of the potential Site-related health risks to human receptors to: (1) evaluate the need for future response actions; (2) provide a basis for assessing concentrations of hazardous substances that may remain onsite without adversely affecting human health; and (3) provide a basis for comparing potential health impacts of various remedial action alternatives and technologies.

The HHRA was developed in accordance with the U.S. Environmental Protection Agency (EPA)-approved *Draft Remedial Investigation Work Plan* (Harding Lawson Associates [HLA] 1994), the Administrative Order on Consent (AOC) for the Site, and EPA risk assessment guidance documents including:

- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A - Interim Final* (EPA 1989);
- *Guidance for Data Useability in Risk Assessments* (EPA 1990a);
- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A, Supplemental Guidance "Standard Default Exposure Factors"* (EPA 1991a);
- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals - Interim* (EPA 1991b);
- *Dermal Exposure Assessment: Principles and Applications* (EPA 1992a);
- *Supplemental Guidance to RAGS: Calculating the Concentration Term* (EPA 1992b);
- *Exposure Factors Handbook, Volumes I - III: General Factors - Review Draft* (EPA 1996a);
- *Exposure Factors Handbook, Volumes I - III: General Factors* (EPA 1997b);
- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments - Interim* (EPA 1998a); and
- Other federal or regional EPA documents, as appropriate.

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1.1 OVERVIEW

A risk assessment is the scientific evaluation of the potential human and environmental health impacts posed by the release of a particular substance or mixture of substances (Paustenbach 1989a). The risk assessment may be used as a guide by risk managers who also must consider factors such as technical feasibility of remedial alternatives, public perception of potential health impacts, and cost/benefit. Risk assessments may establish health-based cleanup levels, evaluate site impacts, or characterize the need for remedial action(s) based on the quantified potential risk.

The organization of this HHRA follows the basic structure as outlined in EPA's Risk Assessment Guidance for Superfund (RAGS) (EPA 1989, 1998a):

- *Data Collection and Evaluation* – Compilation of appropriate data and evaluation of detection frequency, background data, and site data in reference to applicable or relevant and appropriate requirements (ARARs) for each sample medium. Identification of chemicals of potential concern (COPCs) and the rationale for their inclusion or exclusion in the risk assessment;

- *Exposure Assessment* – Characterization of the physical setting, identification of potential receptor populations and exposure pathways, presentation of exposure assumptions, and estimation of exposure point concentrations and exposure intake values;

- *Toxicity Assessment* – Presentation of the toxicity values for carcinogenic and non-carcinogenic effects and source information for these values; and

- *Risk Characterization* – Quantification and combination of cancer and noncancer risks by pathway and media for each receptor evaluated, summation of the risk drivers at the site, and a discussion of the uncertainty associated with the development of risk estimates.

Each of these steps has been utilized to evaluate the potential health risks at the VICHEM Site and are addressed in Sections 2.0 through 5.0 of this document.

This HHRA is an appendix to the Remedial Investigation (RI) Report; a summary of the findings is presented in Section 6.0 of the RI Report. The RI was conducted with the objective of characterizing the distribution of organic and inorganic constituents in surface and subsurface soil, groundwater, and soil/sediment in the Gut System at the Site. The RI defines the concentrations of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals in these sample media. Analytical results are presented and discussed in Section 4.0 of the RI Report.

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1.2 SITE DESCRIPTION AND BACKGROUND

A detailed Site description and background discussion of the VICHEM Site is presented in Section 2.0 of the RI Report. However, the following narrative provides a brief overview of Site information.

The Site is an approximate 32-acre property located on Plot 13Q of Estate Bethlehem Middle Works off of Melvin Evans Highway in the south-central portion of St. Croix, U.S. Virgin Islands. The Site is bordered to the north and east by an intermittent stream, the River Gut, which originates north of the Site and discharges to the Caribbean Sea. Numerous businesses are located adjacent to the Site, including some on the opposite side of the River Gut.

The groundwater underlying the Site flows predominantly to the south. Surficial soils at the Site are classified as a clay loam alluvium, with slopes of two to five percent. The alluvial soils are approximately 85 feet thick and consist of a heterogeneous overburden comprised of brown and gray clay-rich sediments with lesser and varying amounts of silt and fine sands. Underlying the Alluvium is the Kingshill Limestone, which is the principal water-bearing deposit on St. Croix. The Kingshill is described as being comprised of a white to light gray and brown stiff clay, with lesser amounts of sand.

The Site was purchased in 1968 and a variety of pharmaceutical production operations under a number of different corporate entities ensued until 1982. The specific timeframes for these operations are uncertain. The initial interface with environmental regulatory agencies occurred in 1982. Between 1984 and 1989, several investigations were conducted on behalf of Berlex Laboratories, Inc. (Berlex).

The VICHEM Site was placed on the National Priorities List (NPL) in January 1994. On October 6, 1994, EPA entered into an AOC, Index No. II CERCLA-94-0401, with Berlex, one of the Respondents. The AOC required the performance of a RI/Feasibility Study (FS) at the Site.

During the regulatory process, several remedial activities were conducted by both EPA and Berlex. These activities included onsite treatment of impacted soil, onsite stabilization, drum removals, and offsite disposal. Additional investigative activities have continued through 1998.

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2.0 DATA COLLECTION AND EVALUATION

Data and sample collection was conducted during the RI to characterize the overall hydrogeology at the Site and the quality of soils, sediments, and groundwater that may have been impacted by Site operations. A majority of these samples were submitted for laboratory analyses, using current Contract Laboratory Program (CLP) Statements of Work (SOWs), for VOCs, SVOCs, and inorganics (metals and cyanide). All work was conducted in accordance with the EPA-approved RI Work Plans and subsequent addenda. Details relating to specific methods employed during the various phases of investigative work are presented in Section 3.0 of the RI Report.

2.1 SITE MODEL AND EXPOSURE PATHWAYS

Table 1 presents the exposure pathways that were evaluated in the HHRA. Considering the current and future anticipated land use scenarios proposed for the VICHEM Site, several exposure pathways were identified for evaluation. Potential human receptor populations were evaluated for each pathway and either ruled out or included in the risk assessment. This evaluation identified four receptors as being associated with possible exposure pathways that were considered to be hypothetically complete: (1) construction worker, (2) industrial/commercial worker, (3) trespasser, and (4) resident.

Since the Site is presently inactive and abandoned, two current land use receptors were identified. A resident (child/adult) potentially exposed to groundwater via six offsite production wells in the immediate vicinity of the Site was evaluated. However, no COPCs were identified for the groundwater collected from these wells; therefore, no risk estimates were developed for a current residential land use scenario. A detailed discussion of these offsite wells is presented in Appendix B of the RI Report. The current land use evaluation also identified a trespasser (adult/pre-adolescent) as having the potential to come in contact with COPCs in surface soil at the Site and in soil/sediment of the Gut System.

Future land use scenarios evaluated two additional onsite receptors assuming the Site will remain industrial, as established by current zoning requirements. The industrial/commercial worker (adult) was considered for future industrial use of the Site. This pathway examined exposure to COPCs in groundwater, onsite surface soil, and soil/sediment in the Gut System. Construction at the Site was also considered to be a plausible future exposure scenario. This pathway evaluated the adult construction worker's exposure to COPCs in soils at the Site and sediments in the Gut System. These pathways are discussed in further detail in Section 3.0.

Based on EPA's concerns regarding the potential migration of constituents in groundwater, an offsite residential groundwater use exposure scenario was evaluated. Although there are currently no COPCs in offsite production wells, the potential migration of COPCs in onsite groundwater to offsite production wells was conservatively evaluated using groundwater concentrations measured in onsite monitoring/production wells.

2.2 DATA COLLECTION

The primary objective of the RI was to collect the data needed to adequately support a risk assessment, both human health and ecological, and to provide a basis on which a subsequent, cost-effective, remedial action plan will be recommended. During the four phases of investigative work, the following specific data requirements were addressed:

- background concentrations of constituents in surface soil through sampling and analysis;
- nature and extent of potential surface and subsurface soil impacts onsite through sampling and analysis;
- nature and extent of potential groundwater impacts onsite/offsite through sampling and analysis;
- Site-specific geologic and hydrogeologic conditions through lithologic evaluation, water level measurements, etc.; and
- nature and extent of potential soil/sediment impacts in the Gut System (i.e., River, Bethlehem, and Fair Plains Guts) through sampling and analysis.

Data collection methods and locations are discussed in detail in Section 3.0 of the RI Report.

2.3 DATA EVALUATION

Data collected during the RI was used to evaluate the potential risks associated with exposure to groundwater, onsite surface and subsurface soil and soil/sediments in the Gut System. A discussion of the analytical results incorporated into the HHRA is presented in Section 4.0 of the RI Report, along with a tabular presentation of the data.

2.3.1 Selection of Chemicals of Potential Concern

The HHRA evaluated the potential human health risks associated with exposure to COPCs detected in groundwater, soil, and soil/sediment samples that were collected during the four phases of the RI. The maximum concentrations of constituents detected in these media were used in a screening process to develop a focused list of COPCs for evaluation in the risk assessment.

Factors generally considered in the selection of COPCs include toxicity, mobility, persistence, bioavailability, bioaccumulation, the frequency of detection, and the measured concentrations. Additionally, the media in which the constituents are detected and the relationship of measured concentrations to appropriate regulatory standards, guidance criteria, or near-site background concentrations are considered. The selection of COPCs, or indicator chemicals, for a site is addressed in RAGS (EPA 1989).

COPCs were selected using a two-tiered screening approach. Initially, for each medium, a list of detected constituents was developed. In the first tier of screening, the frequency of detections, as well as the maximums, was identified for each detected constituent for each medium of potential concern. Constituents detected at a frequency of greater than 5% were retained for further evaluation. The second tier of data evaluation involved comparison of the sample data with appropriate criteria. Essential nutrients, such as calcium, magnesium, potassium, and sodium, were not included in this step of the evaluation as criteria have not been developed. Constituents for which there was at least one exceedance of the criteria were retained for further consideration as COPCs in this risk assessment.

Frequency of detections

As noted in RAGS, the frequency of detection is an important consideration in selecting the COPCs for a site:

> *"Chemicals that are infrequently detected may be artifacts in the data due to sampling, or other problems, and therefore, may not be related to site operations and disposal practices. Consider the chemical as a candidate for elimination from the quantitative risk assessment if: (1) it is detected infrequently in one or perhaps two environmental media, (2) it is not detected in any other sampled media, and (3) there is no reason to believe that the chemical may be present."*

Frequency of detection was the first thing considered in identifying chemicals detected at the VICHEM Site for consideration as COPCs. A detection frequency of less than five percent was incorporated into the COPC screening process and, as such, individual media sample sets containing 20 or less samples were not subject to a detection frequency screen. For example, in determining the COPCs in surface soils (0 - 1 foot below ground surface [ft bgs]) at the Site, no constituents were deleted on the basis of low detection frequency due to the small sample set evaluated. However, a sufficient number of onsite groundwater samples were available to enable detection frequency screening to be conducted for several of the constituents detected in this medium. The following five chemicals in groundwater were eliminated from further evaluation as their detection frequencies are less than 5%: beryllium (detection frequency - 4.2%), 2-butanone (3.6%), thallium (4.2%), trichloroethene (3.6%), and vinyl chloride (3.6%).

Discussion of the elimination of vinyl chloride as a COPC is further warranted. It indeed was detected in less than 5% of the groundwater samples, however, as a Group A carcinogen, the single detection exceeded the risk-based screening value, and it is volatile (and therefore may be of concern when evaluating potential risks via inhalation while showering). Therefore, other factors should be explained as to why vinyl chloride does not qualify as a COPC in this assessment.

Vinyl chloride was detected in 1 of 28 groundwater samples (3.6%). It was detected one time in groundwater, however, it was not detected in other site media such, as surface and subsurface soil. Based on discussions with personnel knowledgeable about historical site operations, there is no reason to believe that vinyl chloride was utilized by manufacturing operations.

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Additionally, the location of the well (MW-10) where the vinyl chloride detection occurred is considered an upgradient offsite well (with the exception of minor fluctuations in groundwater flow during certain times of the year). Therefore, vinyl chloride was not detected on site property.

The sole detected value (0.2 ppb) was detected below the method detection limit, and therefore given an "estimated" data qualifier. Stepping ahead to the comparison to TBCs (EPA Region III's RBC), the detection of vinyl chloride exceeded the RBC (0.02 ppb) by an order of magnitude, however, this risk would convert to a residential risk of 1×10^{-5}, which is consistent with EPA's target risk range. The estimated concentration of vinyl chloride is also below EPA's MCL (2 ppb) for vinyl chloride. The MCL would be the ARAR that would need to be complied with as part of overall site remediation. These additional considerations further support exclusion of vinyl chloride as a COPC

Comparison with Criteria

Within the individual sample media evaluated, the maximum detected concentrations of constituents detected at a frequency of five percent or greater were compared against ARARs or "to be considered" (TBC) criteria. This included EPA's Generic (direct contact and impact to groundwater) Soil Screening Levels (SSLs) (EPA 1996b), EPA Region III Risk-Based Concentrations (RBCs) (EPA 1999a), Maximum Contaminant Levels (MCLs), or Site-specific background concentrations. Both SSLs and RBCs are health-based criteria and have been developed using standard EPA risk assessment methodology and a target risk of one-in-a-million (10^{-6}) for carcinogens or a hazard quotient (HQ) of one for noncarcinogens. SSLs were developed by EPA "...to help standardize and accelerate the evaluation and cleanup of contaminated soils at sites on the NPL with anticipated future residential land use scenarios." The Region III RBCs were developed to assist Region III toxicologists in screening sites not yet on the NPL, respond to citizen inquiries, or spot-check baseline risk assessments. The primary use of RBCs is for chemical screening during baseline risk assessment process. Like SSLs, the RBCs provide concentrations of chemicals in soil based on the potential for residential use of those soils. However, RBCs also have been developed to provide health-based criteria for exposures involving soils associated with industrial land use. In addition to soils, RBCs have been developed for tap water, ambient air, and fish tissue using conservative default EPA parameters and methodology.

Surface soil constituents were compared first to residential RBCs, or SSLs in the absence of a chemical-specific RBC, and with Site-specific background concentrations for inorganic analytes. Likewise, sediments were compared with either RBCs or SSLs, as available; however, no background sediment concentrations were established. For the purposes of direct contact exposures, subsurface soil detections were compared to industrial RBCs. Since tap water RBCs have the potential to be more conservative than MCLs, these criteria were used for groundwater COPC screening with MCLs used in the absence of a chemical-specific RBC.

Other candidates for exclusion of a chemical from a risk assessment include chemicals "... that are (1) essential human nutrients, (2) present at low concentrations, and (3) toxic only at very

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high doses (*i.e.*, much higher than those associated with the site)...". Examples of some constituents considered to be essential nutrients include iron, magnesium, calcium, potassium, and sodium (EPA 1989). Based on their classification as essential nutrients, near background concentrations, or lack of toxicity criteria, all of these analytes were excluded from quantitative evaluation in the risk assessment with the exception of iron. Due to the relatively high concentrations of iron detected (greater than background or TBC criteria) and the availability of toxicity criteria, iron was retained for evaluation as a COPC in soils and sediments at the Site.

Evaluation of Subsurface Soil

Based on the information presented in Table 2.5, no COPCs were identified for direct contact with subsurface soil at the Site. Consequently, no potential health risks are identified for the inhalation, ingestion or dermal contact of constituents detected in this medium under a current or future land use scenario. In addition to evaluating the potential for risk associated with direct contact of constituents in subsurface soil, the same data were also compared to EPA's SSLs to determine if concentrations could adversely impact groundwater through leaching (comparison presented in Tables 4-7 and 4-9 through 4-13 of the RI Report).

The following constituents were detected at concentrations above the criteria:, ethylbenzene, and total xylenes. Although the maximum concentration of chloroform (410 parts per billion [ppb]) did not exceed the SSL of 600 ppb, this constituent was included as a COPC for the purposes of this evaluation. Additionally, although acetone and methylene chloride detections in subsurface soil were attributed to blank contamination and should not be considered present in this medium, these two constituents were retained as COPCs for the purpose of this evaluation. Two inorganics also were found at concentrations above the SSLs. Cadmium was detected in one sample at 10.1 parts per million (ppm), slightly above the SSL of 8 ppm, and cyanide was detected in three samples ranging in concentration from 47.3 to 60.2 ppm, exceeding the SSL of 40 ppm (based upon a DAF of 20). Cyanide exceeded the SSL (20 DAF) in three of eighteen samples. One sample was validated and detected at a concentration of 51.7 ppm. In one additional subsurface soil boring, at two different depths, cyanide was estimated and qualified with "spike recovery not within control limit" (concentrations = 47.3 ppm and 60.2 ppm). For comparison purposes, an average of cyanide concentrations in site subsurface soil results in a concentration of 9.3 ppm, which is below the SSL. Additionally, cyanide was not detected in any other site media, including groundwater. It should also be noted that a comparison with direct contact risk-based values was performed for cyanide. The Region III RBC for soil ingestion based upon a residential scenario is 160 mg/kg. The direct contact SSL for soil ingestion is 1,600 mg/kg. None of the cyanide concentrations detected exceed these risk-based values. The soil to groundwater and direct contact SSLs were used as a comparison level for cyanide, however, as cyanide is rarely encountered at the site, was not detected in groundwater, and was not used in historical site processes, it was not retained as a COPC in this HHRA.

Likewise, although cadmium was detected across most of the Site, it was only found at a concentration slightly above the SSL at one location; hence, it is not considered a COPC. Therefore, subsurface soil is considered a medium of concern regarding the potential for impact to groundwater and the following constituents are noted as COPCs for the Site: chloroform,

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ethylbenzene, and total xylenes. As expected, this list of constituents is consistent with the VOCs presented in the list of COPCs identified for onsite groundwater.

Evaluation of Lead as a COPC

Using the methodology described above, lead was determined to be a COPC in onsite groundwater as its maximum concentration exceeded EPA's treatment technique action level (TTAL) of 15 ppb. However, it was not carried through the HHRA as a COPC due to its lack of toxicity criteria (see section 4.2), and due to the low concentrations and infrequent detections encountered. Of the 24 groundwater samples collected and evaluated, only one concentration of lead (50.7 ppb at monitoring well MW-10) exceed the TTAL. A more detailed discussion of the exclusion of lead as a COPC is presented in Section 5.6.

COPCs for Use in the Risk Assessment

Tables 2.1 through 2.5 identify the respective organic and inorganic chemicals detected in soils, sediments, and groundwater during the RI. The rationale for the selection of the COPCs at the VICHEM Site is also presented in these tables. The following COPCs were identified for each of the media evaluated:

- *Groundwater (Onsite Monitoring/Production Wells)*

Acetone	Antimony
Chloroform	Arsenic
Ethylbenzene	Barium
Methylene chloride	Chromium (total)
Toluene	Iron
Xylenes	Lead
2,4-Dimethylphenol	Manganese
Isophorone	Vanadium
2-Methylphenol	

- *Groundwater (Offsite Production Wells)*

  No COPCs identified

- *Soil/Sediment in Gut System*

Aluminum	Iron
Arsenic	Manganese
Chromium (total)	Vanadium

- *Surface Soil*

Arsenic	Manganese
Chromium (total)	Vanadium
Iron	Zinc

- *Subsurface Soil*

  No COPCs identified

2.3.2 Development of Exposure Point Concentrations

In quantifying potential exposure, intakes of each COPC were estimated for what is considered to be the Reasonable Maximum Exposure (RME), as well as a central tendency (CT). Datasets representing each of the media of interest were tested for normal or lognormal distribution in accordance with EPA's *Supplemental Guidance to RAGS: Calculating the Concentration Term* (1992b). Datasets that appear to be normally distributed are assigned an exposure point concentration (EPC) represented by the one-sided 95th upper confidence level (95th UCL) of the arithmetic mean. Similarly, if the test for normality/lognormality indicates the data is lognormally distributed or is neither normally nor lognormally distributed, then the RME EPC is calculated as the 95th UCL under the assumption of lognormality. Analytical results identified as undetected within a dataset are incorporated into the development of the 95th UCL concentration using one-half the detection limit including those detection limits identified as elevated. For purposes of this HHRA, the 95th UCL values were used to represent EPCs for the RME and for the evaluation of a CT receptor for those RME scenarios where risk estimates exceeded EPA benchmarks. The CT uses the 95th UCL concentration but median values for exposure factors. Exposure Point Concentrations for the various media evaluated in this Risk Assessment are summarized in Tables 3.1, 3.2, and 3.3. Attachment A provides the rationale used in choosing the EPCs.

In order to evaluate the potential risk to a hypothetical resident through inhalation of VOCs in water vapor, the groundwater RME EPCs were used and converted to vapor concentrations using a shower model recommended by USEPA. The calculations and assumptions utilized in the Shower Model are provided in Attachment B.

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3.0 EXPOSURE ASSESSMENT

Exposure assessment is the process of measuring or estimating the intensity, frequency, and duration of human exposure to a chemical present in the environmental media of interest, or of hypothetical exposures that may occur from a change in the existing exposure scenario or a new release of chemicals into the environment. In its most complete form, an exposure assessment should describe the magnitude, duration, schedule, and route of exposure; the size and nature of human populations exposed; and the uncertainties inherent in all estimates (National Academy of Science [NAS] 1983). In this exposure assessment, the objectives included: (1) the characterization of exposure setting; (2) an identification of potential exposure pathways; and (3) a quantification of potential exposure. These three elements of the exposure assessment are discussed below.

3.1 CHARACTERIZATION OF PHYSICAL SETTING

The VICHEM Site is located in the south-central portion of St. Croix in the U.S. Virgin Islands (see Figure 2-1 of the RI Report). Consisting of approximately 32 acres, it is situated approximately 6.1 miles equidistant from two major towns: Frederiksted to the west and Christiansted to the east. Site access is via Route 66 which traverses the island east and west. The principal land use surrounding the Site is a mix of commercial and industrial.

Over half of the VICHEM Site is covered by buildings and/or process equipment. The surrounding area is predominantly industrial with the Henry Rohlsen Airport situated approximately 1,500 feet south of the Site. The VICHEM Site is bordered to the north and east by an intermittent stream, the River Gut, which originates north of the Site and discharges to the Caribbean Sea. Numerous businesses are located adjacent to the Site, including some on the opposite side of the River Gut. The south-southwest boundary of the VICHEM Site abuts Route 66, while an undeveloped lot exists to the west-northwest.

The VICHEM Site was developed during the early 1970s and is currently abandoned and overgrown with heavy vegetation. Several structures remain onsite, including (see Figure 2-2 of the RI Report):

- laboratory/warehouse building which housed analytical laboratories, restrooms, storage room, dryer area, and worker cafeteria;
- maintenance building which housed two boilers, refrigeration units, air compressors, and maintenance shop;
- nine aboveground storage tanks (ASTs) identified as T-3 through T-11, an unlabeled AST, and eleven concrete pads at former AST locations;
- production area which housed a centrifuge and dryer building;
- stainless-steel reactor area;
- glass reactor area;
- loading dock (former location of laboratory pit);

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- concrete storage pad adjacent to the loading dock and next to the scalehouse;
- cooling towers;
- generator building;
- generator and fire pump building;
- two production wells (P-1 and P-2) originally used for process water and for the fire fighting system; and
- one 250,000-gallon fire water AST.

Two storm drains are located onsite. The Central Storm Drain runs beneath the paved area between the laboratory and maintenance buildings. The Southern Storm Drain, where observed, is a concrete-lined depression along the southern wall of the maintenance building and the edge of the reactor area. Both storm drains discharge to the River Gut.

3.1.1 Current Water Use

Potable water for the island is primarily supplied through both municipal well water and desalinization plants. Additionally, some residences have private cisterns and roof-catchment systems to capture and containerize precipitation.

A water use survey was conducted in October 1998 to collect information on wells location within a ½-mile radius of the Site. The purpose of this survey was to collect information on construction details, pumping rates, and general water use for wells located in the vicinity of the VICHEM Site that could potentially be affected by Site impacts or that could potentially influence groundwater flow across the Site via pumping. The Kingshill Limestone (deep water-bearing zone) is considered the principal water-bearing deposit on St. Croix and is the principal aquifer in the Barren Spot, Concordia, and Negro Bay well fields. The Alluvium (shallow water-bearing zone) is tapped by many private and public supply wells and is the principal aquifer in the Fair Plains, Golden Grove, and Adventure well fields. The information collected during the survey is provided in Appendix B of the RI Report.

Survey results indicated that water from several offsite wells in the area of the VICHEM Site are currently being used for light industrial purposes. However, water is not being extracted from these wells on a constant or continual basis. Additionally, several local plant operations have been entirely shut down or severely decreased. Therefore, offsite pumping influences that may have affected onsite groundwater flow conditions in the past, or wells that could have historically been affected by Site impacts, currently no longer exist to the same extent.

3.1.2 Gut System

The VICHEM Site is located in the southern lowland valley portion of the River Gut, the largest intermittent stream on St. Croix. The River Gut encompasses a drainage area of approximately 11 square miles. In the vicinity of the Site, the River Gut extends across the southern plain of St. Croix, and at its confluence with the Bethlehem Gut (located approximately 800 feet to the southeast of the Site), it becomes the Fair Plains Gut. All of the stream channels in the drainage basin are identified as intermittent. The River Gut drains to the Caribbean Sea, via the Fair

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Plains Gut and Manning Bay, located approximately one mile southeast of the Site. Low hills to the east and southwest of the Site rise to elevations of approximately 150 to 200 feet above mean sea level (amsl).

The land surface bordering the east-northeast Site boundary slopes steeply downward approximately 12 to 15 feet into the River Gut. An earthen berm partially separates the AST Area in the western portion of the Site from the remainder of the area. On the western portion of the berm, runoff drains from southwest to northeast. Surface drainage in the eastern portion of the Site controlled by the buildings, concrete paved areas, and two storm drains (Central Storm Drain and Southern Storm Drain) that channel runoff to the River Gut along the southeastern Site boundary.

3.2 EXPOSURE PATHWAYS AND POTENTIALLY-EXPOSED POPULATIONS

The potential exposure pathways of ingestion, inhalation, and dermal absorption via contact with the COPCs in groundwater, soils, and sediments were evaluated for completeness. For an exposure pathway to be complete, it must have four elements: (1) a source and mechanism for chemical release; (2) an environmental transport medium (*e.g.*, air, water, soil); (3) a point of potential human contact with the medium; and (4) a route of uptake for the chemical at the contact point (*e.g.*, inhalation, ingestion, dermal contact).

Considering the current and future anticipated land use scenarios proposed for the VICHEM Site, several exposure pathways were identified for evaluation and are presented in Table 1. Potential human receptor populations were evaluated for each pathway and either ruled out or included in the risk assessment. Potential exposure pathways are further discussed below.

3.2.1 Current Land Use

Since the Site is presently inactive and abandoned, the two receptor populations considered for potential exposure under current land use conditions include an offsite resident and an onsite trespasser. Residential (child/adult) exposure to groundwater via six production wells was considered. As discussed in Section 2.3.1 and presented in Table 2.1, no COPCs were identified for the groundwater collected from these offsite wells in the immediate vicinity of the Site; therefore, no risk estimates were developed for this current land use. Trespasser (pre-adolescent/adult) exposure to COPCs in surface soil/sediment collected from the Site and the Gut System was evaluated for current Site conditions. Exposure to COPCs via incidental ingestion, dermal contact, and inhalation of particulates was evaluated for this receptor.

3.2.2 Future Land Use

The future land use scenarios evaluated were based on the premise that the Site, which is currently zoned for light industrial use, will remain industrial/commercial in the future. This assumption is based on information from the Virgin Islands Department of Planning and Natural Resources (VIDPNR) which indicates that the Site is currently zoned as I-2 (Light Industry). A map depicting current zoning for the Site and surrounding area is presented in Appendix A of the

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RI Report. Future zoning for the area is uncertain at this time. VIDPNR has indicated that a draft zoning plan for the island has been developed for future land use and is currently under review by the local government. If the zoning classification of I-2 is revised in the future, the need to address the possibility for residential land use of the property would be re-evaluated. The industrial/commercial (adult) exposure pathway examined exposure to COPCs in groundwater, surface soil, and soil/sediment via ingestion, dermal contact, and inhalation of VOCs (groundwater) and particulates (soil and soil/sediment).

Construction at the Site also was considered to be a plausible future exposure scenario. This pathway evaluated the adult construction worker's exposure to COPCs in onsite surface soil and subsurface soil (to 12 ft bgs) and soil/sediment in the adjacent Gut System via incidental ingestion, dermal contact, and inhalation of particulates. Exposure to groundwater was not evaluated for this receptor since groundwater at the Site is generally encountered at depths between 18 and 20 ft bgs. Since construction activities are not anticipated to occur at such depths, exposure to groundwater was not considered. Although subsurface soil at the Site was identified as an exposure medium for this receptor, no risk estimates were developed since no COPCs were identified for direct contact with this medium.

In addition to evaluating the potential for risk associated with direct contact of constituents in subsurface soil, the same data also was compared to EPA's SSLs to determine if concentrations could adversely impact groundwater through migration (leaching). The results of this evaluation are discussed in Section 4.0 of the RI Report.

An offsite residential scenario was evaluated for potential future exposure to COPCs in groundwater. Currently, there are no COPCs in the offsite wells. However, EPA and VIDPNR have raised concerns regarding the uncertainties associated with future land use/development in the vicinity of the Site and the potential for COPCs in onsite groundwater to migrate offsite. Therefore, future exposure to COPCs in groundwater via ingestion, inhalation, and dermal contact was quantified for an adult and child resident. Specifically, a future adult and child resident were evaluated for potential exposure to COPCs in groundwater via ingestion of well water, dermal contact while showering/bathing, and inhalation of VOCs while showering/bathing.

3.3 QUANTIFICATION OF POTENTIAL EXPOSURES

Potential exposures associated with each of the exposure pathways listed in Tables 4.1 through 4.11 (Values Used for Daily Intake Calculations) are quantitatively evaluated in this HHRA. Quantification of potential site exposures involves integrating media-specific EPCs and exposure parameter values through route-specific exposure models. The estimation of intake must take into account several factors including the concentrations of COPCs to which each population may be exposed, the bioavailability of each COPC in their given media, and the values of exposure parameters which describe human behavior and physiology. The noncarcinogenic and carcinogenic intake estimates are presented in Tables 7.1 through 7.22 and 8.1 through 8.22, respectively. Each of the elements incorporated into the derivation of the intake estimates is discussed in the following sections.

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3.3.1 Exposure Intakes

The health hazards associated with exposure to a chemical are related to the degree of uptake. For any route of exposure, uptake (U) is the product of exposure (E) and the absorption efficiency or bioavailability (B):

$$U = E \times B$$

Although the various exposure parameters may make this equation appear more complex, the mathematical relationship shown above holds true for all exposure routes and is expressed as mass of chemical per mass of body weight per day (mg/kg/day). In accordance with EPA guidance (1989 and 1992), the exposure models presented in Tables 4.1 through 4.11 are used to estimate potential exposures to COPCs associated with ingestion, dermal contact, and inhalation pathways.

3.3.2 Exposure Parameter Values

The exposure models and parameters presented in Tables 4.1 through 4.11 take into account various exposure parameters in the derivation of chemical uptake. Standard EPA default values found in *RAGS Parts A and B* (EPA 1989, 1991a, 1991b) and EPA's *Exposure Factors Handbook* (1996a, 1997b) were used in most cases. Exposure parameter values are presented for both the RME and CT receptors for those scenarios where the RME risk estimates exceed target benchmarks (*i.e.*, 1 x 10^{-6} for carcinogenic risk and 1 for noncancer HQs). The technical justification for the selection of exposure parameter values used in estimating potential Site-related exposures for the industrial/commercial worker, construction worker, and trespasser scenarios are described in the following subsections.

3.3.2.1 Exposure Time

Exposure time (ET) for both the RME and CT industrial and construction workers was assumed to be 8 hours/each working day. RME trespassers were conservatively assumed to spend 4 hours at the Site or in the Gut System for each trespassing event while CT adult trespassers were assumed to spend half that amount of time (2 hours) trespassing.

For the residential scenarios, exposure times varied according to the pathway evaluated. For the ingestion pathway, a 24-hour day was used as the ET for both the child and adult RME and CT exposures. For both the adult and child bathing scenarios, RME and CT exposure times of 32 and 10 minutes/day, respectively, were used. These ETs are EPA-recommended values and representative of the length of both an adult's shower and a child's bath (EPA 1996a). The ET for the RME scenario assumes that 12 minutes are spent showering/bathing and 20 minutes are spent in the bathroom following showering/bathing. These conservative assumptions were used to calculate the EPCs for vapor phase VOCs and were also used for calculation of intake for consistency.

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3.3.2.2 Exposure Frequency

The HHRA incorporates several assumptions regarding exposure frequency (EF) for each of the scenarios evaluated. For the RME receptor, trespassers are assumed to enter the Site 2 times/week, year round (104 days/year) and 1 day/week for the CT adult receptor (52 days/year). The frequency of exposure is expected to be fairly consistent throughout the year as a result of the warm climate.

Both the future industrial/commercial and construction scenarios (RME and CT) incorporate an EF of 250 days/year, based on an assumed 5-day work week and 2 weeks of vacation time spent away from the facility (EPA 1989). The exposure frequency used for all residential exposure scenarios is 350 days/year, which accounts for 15 days of the year spent away from home (*e.g.*, vacation) (EPA 1991a).

3.3.2.3 Exposure Duration

The exposure duration (ED) incorporated in the HHRA assumes that the RME and CT industrial worker spends 25 and 6.6 years, respectively, working at the Site (EPA 1996a). The adult trespasser is assumed to live near the Site resulting in an ED of 30 years for the RME receptor and 9 years for the CT receptor (EPA 1996a). The same RME and CT EDs were used for the offsite residential adult. A 6-year ED was used for the child resident for both the RME and CT evaluations (EPA 1989). Exposure duration was set at 1 year for the construction worker (assuming a year-long construction project) and 5 years for the pre-adolescent assuming that trespassing activities occur from 7 to 12 years of age.

3.3.2.4 Inhalation Rate

Inhalation rates (IN) of 1.3 m^3/hr and 3.5 m^3/hr were used for the CT and RME construction worker scenarios, respectively. These values are the mean and upper percentile inhalation rates for a male outdoor worker (EPA, 1996a). Standard default inhalation rates of 0.833 m^3/hr for all other adults and 0.42 m^3/hr for children (EPA 1989) were used for both the CT and RME calculations. The child inhalation rate was also used for the pre-adolescent youth trespasser.

3.3.2.5 Particulate Emission Factor

Intake via inhalation of particulate matter requires the use of a particulate emission factor (PEF). For purposes of this assessment, the EPA default value of $1.32 \times 10^{+9}$ was used to calculate chronic intake (EPA 1996b).

3.3.2.6 Volatilization Factor

Intake via inhalation of VOCs from water requires the use of a volatilization factor (K). A value of 0.5 L/m^3 was used in this HHRA and is representative of a residential scenario where water is used for cooking, cleaning, and showering. This volatilization factor was also used in the shower model to estimate EPCs for vapor phase VOCs. There are no volatile COPCs in surface soils.

3.3.2.7 Ground Water Ingestion Rate

EPA-recommended (1996a) drinking water intake rates were used to derive a rate of 0.7 L/day for the CT industrial/commercial worker and 1.2 L/day for the RME industrial/commercial worker. These rates start with the recommended mean and upper percentile (90^{th}) rates of 1.4 and 2.4 L/day, respectively. Assuming these rates are applied to 16 waking hours/day, with 8 of those hours spent at the workplace, these overall daily rates were divided by 2 to represent the occupational ingestion rates (CT and RME) and account for the fraction of drinking water consumed at work.

The recommended mean and upper percentile ingestion rates of 1.4 and 2.4 L/day, respectively, were used for the adult residential CT and RME exposures (EPA 1996a). For a child resident, the CT and RME values used were 0.87 and 1.5 L/day, respectively (EPA 1996a).

3.3.2.8 Exposed Skin Surface Area

The skin surface area (SA) assumed to be exposed and in contact with exposure media varies depending on the site, exposure scenario, type of activity, and potentially exposed population.

For the industrial/commercial and construction adult worker, it was assumed that the total surface area of the upper extremities (head, forearms, and hands) may come into contact with the Site media. This surface was estimated to be 3,300 cm^2 based on the average of the 50^{th} percentile upper extremities surface area estimates for adult men (3,720 cm^2) and women (2,870 cm^2) (EPA 1999c).

The adult trespasser surface area is 5,700 cm^2 and the pre-adolescent trespasser surface area is 2,800 cm^2, based on exposure to head, hands, forearms, and lower legs (EPA 1999c).

For both the RME and CT residential exposure evaluations, total body surface areas were used to evaluate bathing scenarios. An adult skin surface area of 18,150 cm^2 was used. A child skin surface area of 7,195 cm^2 was used and also is based on the average 50^{th} percentile total body surface area of male and female children ages 3 to 6 years old (EPA 1996c).

3.3.2.9 Dermal Absorption

Bioavailability is a measure of the degree to which a chemical is absorbed following exposure (Paustenbach 1987). For exposure to COPCs in soil and sediment, bioavailabilities are reported as the percentage of the applied or administered chemicals that are ultimately absorbed into the body via a given exposure route. Compound-specific dermal absorption (DABS) factors are applied to estimate dermal uptake of chemicals. For the COPCs identified in soil/sediment at the VICHEM Site, a DABS was only available for arsenic (0.03, or 3%; EPA, 1998b); the remaining COPCs can not be evaluated quantitatively in this HHRA. A discussion of inability to quantify dermal risks and hazard for these chemicals, and the potential underestimation of risk and hazard will be discussed in the uncertainty section.

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For dermal absorption of COPCs in groundwater, chemical-specific permeability coefficients (Kp) must be considered when determining intake. The Kp value, expressed as centimeters per hour (cm/hr), represents the rate at which a chemical penetrates the skin. The following permeability coefficients were applied to calculate dermally-absorbed doses for COPCs in groundwater:

• acetone	5.69×10^{-4}	antimony	1.0×10^{-3}
• chloroform	8.9×10^{-3}	arsenic	2.7×10^{-6}
• ethylbenzene	7.4×10^{-2}	barium	1.0×10^{-3}
• methylene chloride	4.5×10^{-3}	chromium^{6+}	2.0×10^{-3}
• toluene	4.5×10^{-2}	iron	1.0×10^{-3}
• xylenes	8.0×10^{-2}	manganese	1.0×10^{-3}
• 2,4-dimethylphenol	1.5×10^{-2}	vanadium	1.0×10^{-3}
• 2-methylphenol	1.0×10^{-2}		
• isophorone	4.4×10^{-3}		

The above-listed permeability coefficients used to estimate dermal absorption of the COPCs in groundwater were obtained from EPA, from scientific literature, or derived using an empirical model presented in EPA's 1992 *Dermal Exposure Assessment* guidance document. Antimony, barium, iron, manganese, and vanadium were assumed to have the same permeability coefficient as water (1.0×10^{-3} cm/hr) based on studies presented by EPA (1992a). The value for arsenic was taken from a CRC Lewis Publishers document entitled *Bioavailability in Environmental Risk Assessment* (Hrudey, *et al* 1996)

3.3.2.10 Soil to Skin Adherence Factor

Adherence of soil to exposed skin is an integral consideration in assessing dermal exposure to contaminated soil. The literature provides a range of soil to skin adherence factors (SSAF) from four studies (Lepow *et al.*, 1975; Roels *et al.*, 1980; QueHee *et al.*, 1985; Driver *et al.*, 1989). In evaluating these studies, EPA indicated that each study has some degree of associated uncertainty (EPA 1992a). Although a range of 0.17 mg/cm^2 to 1.5 mg/cm^2 was reported from these studies, since the data are derived only from hand measurements, the range over estimates the average adherence for the entire exposed skin area. EPA (1992a) states that "...the lower end of this range (0.2 mg/cm^2) may be the best value to represent an average overall exposed skin and 1 mg/cm^2 may be a reasonable upper value". Subsequent guidance from EPA (1999c) has decreased the SSAF; therefore the following values (in mg/cm^2) were used in the HHRA:

	RME	CT
Adult trespasser	0.07	0.01
Pre-adolescent trespasser	0.2	-
Adult worker	0.2	0.02

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3.3.2.11 Soil Ingestion Rate

The recommended average soil ingestion rates (IR-S), found in EPA's *Exposure Factors Handbook* (1996a), is 50 mg/day for an adult and 100 mg/day for a child. Therefore, 50 mg/day was used to represent the IR-S for the industrial/commercial worker and adult trespasser, and 100 mg/day was used as the IR-S for the pre-adolescent trespasser.

There is much debate surrounding the estimation of soil intake rates as noted by the high degree of uncertainty associated with the recommended central estimate ingestion rate of 50 mg/day for adults. This uncertainty is based partly on the low level of confidence associated with the studies used to estimate this rate. Consequently, EPA states that, "Considering the uncertainties in the central estimate, any speculation about an upper percentile would be inappropriate." Based on this observation, the ingestion rate of 50 mg/day was used to represent both CT and RME exposures for the adult (industrial/commercial worker and trespasser) receptors evaluated in the HHRA (EPA 1996a).

Although EPA presents an upper percentile value of 400 mg/day for soil ingestion in children, this value was not incorporated into the HHRA RME evaluation for two reasons. First, the ingestion rate of 400 mg/day was based on a short study period and is not considered to represent usual intake. Secondly, studies conducted in children focus primarily on very young children (*i.e.*, under 5 years of age) and, as such, do not appropriately represent the pre-adolescent age group evaluated in the HHRA. In the *Exposure Factors Handbook*, EPA further states that there is insufficient data to recommend upper percentile estimates for both children and adults. As such, the ingestion rate of 100 mg/day was used to represent both CT and RME exposures for the pre-adolescent trespasser.

For the construction worker, it is assumed that exposure to COPCs in soil and soil/sediment would occur during both excavation and building construction activities. The EPA default soil ingestion rate of 480 mg/day was used as the RME parameter for this receptor. For the CT estimate, 100 mg/day was chosen as it is the USEPA standard default value for adults (USEPA, 1991a).

3.3.2.12 Body Weight

For this assumption, body weight for all adult receptors was assumed to be 70 kg, 45 kg for the pre-adolescent trespasser and 15 kg for the child resident (EPA 1989, 1991a, 1996a).

3.3.2.13 Averaging Time

An averaging time (AT-C) of 25,550 days was used in the assessment of carcinogenic risks based on a 70-year life expectancy (70 years x 365 days/year). The averaging times employed for noncarcinogenic evaluations (AT-N) were calculated based on pathway-specific exposure durations:

$$\text{AT-N (days)} = \text{ED (years)} \times 365 \text{ (days/year)}$$

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3.3.3 Exposure Point Concentrations

As previously discussed, EPCs were calculated in accordance with EPA's *Supplemental Guidance to RAGS, Calculating the Concentration Term* (1992b). This value was used to determine the contaminant intake for each exposure route and chemical constituent. EPA recommends using the 95th UCL of the arithmetic mean due to the uncertainty associated with estimating the true average concentration at a site. The results of these derivations are presented in Attachment A.

3.3.4 Exposure Intakes

The models used to derive exposure intakes are presented below for each of the pathways evaluated. These models are in accordance with EPA's *RAGS Parts A and B* (EPA 1989, 1991a, 1991b) and also are presented in Tables 4.1 through 4.11.

Ingestion of Soil/Sediments

$$Exposure\ Intake\ (mg/kg/day) = \frac{CS \times CF \times ED \times EF \times IR - S}{BW \times AT}$$

CS Chemical Concentration in Soil/Sediment (mg/kg)
CF Conversion Factor (1 x 10^{-6} kg/mg)
ED Exposure Duration (yr)
EF Exposure Frequency (d/yr)
IR-S Soil Ingestion Rate (mg/d)
BW Body Weight (kg)
AT Averaging Time (d)

Dermal Exposure to Soil/Sediments

$$Exposure\ Intake(mg/kg/day) = \frac{CS \times CF \times ED \times EF \times SA \times SSAF \times DABS}{BW \times AT}$$

CS Chemical Concentration in Soil/Sediment (mg/kg)
CF Conversion Factor for kg/mg (1 x 10^{-6} kg/mg)
ED Exposure Duration (yr)
EF Exposure Frequency (d/yr)
SA Skin Surface Area (cm^2)
SSAF Soil to Skin Adherence Factor (mg/cm^2)
DABS Dermal Absorption Factor (unitless)
BW Body Weight (kg)
AT Averaging Time (d)

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Inhalation of Particulates

$$Exposure\ Intake\ (mg/kg/day) = \frac{CS \times ED \times EF \times ET \times IN}{BW \times AT \times PEF}$$

CS	Chemical Concentration in Soil/Sediment (mg/kg)
ED	Exposure Duration (yr)
EF	Exposure Frequency (d/yr)
ET	Exposure Time (hr/d)
IN	Inhalation Rate (m^3/hr)
PEF	Particulate Emission Factor (m^3/kg)
BW	Body Weight (kg)
AT	Averaging Time (d)

Ingestion of Groundwater

$$Exposure\ Intake\ (mg/kg/day) = \frac{CW \times ED \times EF \times IR-W}{BW \times AT}$$

CW	Chemical Concentration in Groundwater (mg/L)
ED	Exposure Duration (yr)
EF	Exposure Frequency (d/yr)
IR-W	Water Ingestion Rate (L/d)
BW	Body Weight (kg)
AT	Averaging Time (d)

Dermal Exposure Groundwater

$$Exposure\ Intake\ (mg/kg/day) = \frac{CW \times CF \times ED \times EF \times ET \times SA \times Kp}{BW \times AT}$$

CW	Chemical Concentration in Groundwater (mg/L)
CF	Conversion Factor (1 x 10^{-3} L/cm^3)
ED	Exposure Duration (yr)
EF	Exposure Frequency (d/yr)
ET	Exposure Time (hr/d)
SA	Skin Surface Area (cm^2)
Kp	Permeability coefficient (chemical-specific) (cm/hr)
BW	Body Weight (kg)
AT	Averaging Time (d)

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Inhalation of Volatile Organic Chemicals from Groundwater

$$Exposure\ Intake\ (mg/kg/day) = \frac{CW \times ED \times EF \times ET \times IN \times K}{BW \times AT}$$

CW	Chemical Concentration in Groundwater (mg/L)
ED	Exposure Duration (yr)
EF	Exposure Frequency (d/yr)
ET	Exposure Time (hr/d)
IN	Inhalation (m^3/hr)
K	Volatilization Factor (L/m^3)
BW	Body Weight (kg)
AT	Averaging Time (d)

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4.0 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to weigh available evidence regarding the potential for COPCs to cause adverse health effects in exposed individuals. In addition, the toxicity assessment attempts to provide an estimate of the relationship between the extent of exposure to a constituent and the increased likelihood and/or severity of adverse effects (EPA 1989). This also may be referred to as dose-response evaluation.

4.1 DOSE RESPONSE

Dose-response assessment is the process whereby the relationship between the dose of an agent and the anticipated incidence of an adverse health effect in an exposed population is characterized (Preuss and Ehrlich 1987). For many chemicals, the human epidemiological evidence is inadequate to conclude that a causal relationship exists between exposure and chronic adverse health effects. Thus, a quantitative dose-response relationship cannot be constructed on such data. Scientific understanding of the dose-response relationship is largely based on data collected from animal studies (usually rodents) and hypotheses about what might occur in humans. Mathematical models are used to estimate the possible responses at levels far below those tested in animals. These models contain several limitations that should be considered when risk estimates are evaluated.

The end result of the dose-response assessment is the determination of human uptake levels that provide an adequate measure of protection to exposed persons for carcinogenic (cancer) and noncarcinogenic (non-cancer) endpoints. The derivation of acceptable levels of exposure, the manner in which these levels are used in this risk assessment, and some of their limitations are described below.

Among the strongest limitations of most health criteria are the uncertainties inherent in extrapolating results obtained in animal research to humans, and the shortcomings in extrapolating responses obtained from high dose research studies to estimate responses at very low doses. Such doses may be effectively handled by the myriad of human biological protective mechanisms (Ames *et al.* 1987). Consequently, the results of standard rodent bioassays cannot define human biological hazards or cancer risks posed by typical levels of exposure. Rather, animal studies provide a basis for extrapolation to potential human health impacts (Crump *et al.* 1976; Sielken 1985; Paustenbach 1989b). However, it should be noted that there are instances when sensitive populations may be more susceptible to a certain chemical than the results from laboratory studies would indicate (Cogliano et., al, 1996).

Toxicity criteria were primarily derived from EPA's Integrated Risk Information System (IRIS) (EPA 1999b) and Health Effects Assessment Summary Tables (HEAST) (EPA 1997a). The EPA Region III RBC Table (EPA 1999a) also was consulted when adequate data were not available through IRIS. In the sections that follow, the approaches and assumptions applied in assessing both noncarcinogenic and carcinogenic responses are described.

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4.2 NON-CARCINOGENIC RESPONSE

It is widely accepted in the scientific community that most biological effects of chemical substances occur only after a threshold dose has been achieved (Klaassen *et al.* 1986). A threshold dose is a level of intake below which adverse effects are not anticipated. For the purpose of establishing risk criteria levels, the threshold dose is usually estimated from the no observed adverse effect level (NOAEL) or the lowest observed adverse effect level (LOAEL) determined in chronic animal studies. The NOAEL is defined as the highest dose at which no observable adverse effects occur, while the LOAEL is defined as the lowest dose at which observable adverse effects begin to appear.

NOAELs and LOAELs derived from both animal and human studies are used by EPA to establish chronic RfDs for humans. The RfD is a daily uptake level (mg/kg/day) for the human population, including sensitive sub-populations, that is not expected to cause adverse health effects over the duration of the exposure (EPA, 1989). Uncertainty factors are applied into the RfD and RfC (reference concentrations in air which are converted into RfD_is) development process to account for limitations in the quality or quantity of available data. Specifically, uncertainty factors can be applied for the following reasons: (1) human variability in the general population; (2) the extrapolation of animal data to humans; (3) when a NOAEL from a subchronic study is the basis for the chronic RfD; and (4) when a LOAEL, rather than a NOAEL, is used to develop the RfD. Uncertainty factors are generally applied for the reasons above, in multiples of 10 (although values less then 10 may be used). With respect to the derivation of reference concentrations (RfCs), many include a 1000-fold safety factor due to the associated uncertainties (Finley et. al, 1992). A modifying factor is also applied to reflect a qualitative professional assessment of additional uncertainties in theoretical study and in the entire database for the chemical not explicitly addressed by the preceding uncertainty factors (USEPA, 1989). For example, if available data do not establish a NOAEL and/or there are data gaps for some types of health effects, a safety factor of 1,000, representing an uncertainty factor of 100 and a modifying factor of 10, could be used to establish the RfD. Inherent in this approach is the assumption that these chemicals have a "threshold dose" below which adverse effects would not occur.

Tables 5.1 and 5.2 present the health criteria used to evaluate noncarcinogenic effects. For the purposes of this HHRA, RfDs and reference concentrations (RfCs) established by EPA provide the basis for assessing potential noncarcinogenic chronic health risks for exposed populations. If toxicity values were not available, the potential for risk is discussed qualitatively in Section 5.0.

Of the constituents investigated in this HHRA, lead is the only constituent lacking the toxicity criteria required to develop a quantitative estimate of the potential for noncancer effects associated with its exposure. As such, it is typically addressed separately from other chemicals in a risk assessment. A separate risk worksheet is being developed as part of RAGS D to address the assessment of hazards associated with lead exposures but was not yet available at the time this risk assessment was completed. Due to this fact, and the low concentrations encountered, lead was not quantitatively evaluated as a COPC in groundwater. A qualitative evaluation of lead as a COPC is discussed in Section 5.6.9.

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4.3 CARCINOGENIC RESPONSE

The accepted regulatory approach generally assumes that potentially carcinogenic chemicals should be treated as if they have no threshold of activity (Paustenbach 1989a). To estimate theoretically plausible responses at low doses, various mathematical models that describe the expected quantitative relationship between risk and dose can be used (Paustenbach 1989b). The mathematical model currently used by EPA for low-dose extrapolation is a form of the linearized multistage model (LMS). This model is based on the multistage theory of the carcinogenic process. This model suggests that a cell may go through a sequence of specific changes (stages) before reaching a malignant state. The LMS model is used in EPA carcinogen risk assessments to estimate the dose-response characteristics of carcinogenicity at low exposure levels typically encountered in the environment because it assumes linearity between dose and effect (*i.e.*, no threshold for carcinogenicity). The slope of the dose response curve at low doses, the "slope factor", is used as a measure of the carcinogenic potential of a chemical; the higher the slope factor, the greater the carcinogenic potential.

Health risks for exposure to carcinogens are defined in terms of probabilities. These probabilities identify the likelihood of a carcinogenic response in an individual that receives a given dose of a particular constituent. The slope factor (SF), expressed in units of $(mg/kg\text{-}day)^{-1}$, multiplied by the intake value (dose) of the chemical, provides an estimate of the theoretical excess risk of developing cancer.

The following EPA Weight of Evidence Classification was used to determine which COPCs would be evaluated for potential carcinogenic effects:

Group A	Human carcinogen (sufficient evidence of carcinogenicity in human)
Group B1	Probable human carcinogen (limited evidence of carcinogenicity in humans)
Group B2	Probable human carcinogen (sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans)
Group C	Possible human carcinogen (limited evidence of carcinogenicity in animals or lack of human data)
Group D	Not classifiable as the human carcinogenicity (inadequate or no evidence)

The COPCs are presented with their ratings in Tables 6.1 and 6.2. In accordance EPA guidance (EPA 1989), only those chemicals with a Group A, B (B1 or B2), or C classification were addressed for possible carcinogenic effects. For this HHRA, the COPCs addressed for possible carcinogenic effects included chloroform, methylene chloride, isophorone, chromium, and arsenic.

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5.0 RISK CHARACTERIZATION

Risk characterization is the culmination of the health risk assessment process and is the point at which a scientific interpretation of the assessment is provided (EPA 1992c and 1992d). In the risk characterization, the information, results, conclusions, and uncertainties from the data collection and evaluation, exposure assessment, and toxicity assessment are integrated into an overall depiction of potential health risks associated with current site conditions. Not only are potential noncarcinogenic and carcinogenic health risks quantified (NAS 1983), but also, EPA guidance has specified that the risk characterization should prominently display and openly discuss the critical uncertainties of the analysis. These guidelines further specify that four critical tasks be accomplished by the risk characterization (EPA 1992c). According to EPA, the risk characterization:

> *"Integrates the individual characterizations from the hazard identification, dose response, and exposure assessments; provides an evaluation of the overall quality of the assessment and the degree of confidence the authors have in the estimates of risk and conclusions drawn; describes risks to individuals and population in terms of extent and severity of probable harm; and, communicates results of the risk assessment to the risk manager" (EPA 1992c).*

In the risk characterization for the VICHEM Site, estimates of carcinogenic and noncarcinogenic risks were quantified, when possible, for each COPC under the exposure scenarios identified in Section 3.0. These estimates are based on the data, evaluations, and analyses presented in previous sections of this HHRA and, in keeping with EPA guidance, the risk characterization presents a discussion of the conclusions and most significant uncertainties (those that define and explain the risk estimates).

5.1 NONCARCINOGENIC RISK CHARACTERIZATION

Noncarcinogenic hazards are estimated by dividing the calculated estimated chronic daily intake (CDI) for each noncarcinogen (mg/kg-day) by the appropriate RfD (mg/kg-day). The resulting ratio is termed the HQ.

$$HQ = CDI/RfD$$

HQs are summed across COPCs for each media contaminated with more than one compound, yielding Cumulative Hazard Indices (HIs). A summation of the chemical HIs is presented for each of the target organs identified, in addition to an overall summation which presents the most conservative HQ without regard to toxic endpoint.

Tables 7.1 through 7.22 present the RME and CT non-carcinogenic risk hazard quotients and hazard indices for each scenario evaluated in this risk assessment.

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5.2 CARCINOGENIC RISK CHARACTERIZATION

Carcinogenic risks are estimated by multiplying the estimated CDI for each carcinogen (mg/kg-day) by its SF ((mg-kg-day)$^{-1}$). The result is a chemical-specific excess lifetime cancer risk (ELCR).

$$ELCR = CDI \times SF$$

This value represents a conservative upper-bound probability of developing cancer during a 70-year lifetime as a result of exposure to the chemical concentrations and media evaluations. Within each media, cancer risks were summed across chemicals for each pathway of exposure to yield an excess lifetime incremental cancer risk for a hypothetical individual within each potentially-exposed population. In addition, in cases where an individual from a given scenario could be exposed to multiple exposure routes across several media, risks also are summed across exposure pathways and media to yield a total risk estimate for that receptor.

Cancer risks are summed regardless of differences in target organ, weight-of-evidence for human carcinogenicity, or potential chemical interactions (*e.g.*, antagonistic or synergistic effects). This approach is consistent with EPA's current approach to carcinogenic effects, which is to assume effects are additive unless adequate information to the contrary is available (EPA 1989).

Tables 8.1 through 8.2 present the calculated carcinogenic risks for each scenario evaluated in this risk assessment.

5.3 EVALUATION OF RISK ESTIMATES

The significance of the potential risks estimated for this Site is evaluated by comparing the calculated risks to established target levels. Federal agencies have adopted target levels of risk that have been deemed acceptable based on several factors, notably the benefits of the chemical being regulated, the ability to avoid risk from other sources, and the cost factors involved in reducing that risk. EPA has established target levels for the evaluation of carcinogenic risks and noncarcinogenic hazards at hazardous waste sites. The target hazard level for noncarcinogenic effects is a HI of 1 (EPA 1989). EPA's guidelines state that the total incremental carcinogenic risk for an individual resulting from multiple-pathway exposures should not exceed a range of 10^{-6} to 10^{-4} (EPA 1989).

5.4 RISK ESTIMATES

Based on the identification of sources, pathways, and receptors, estimates of human health risk were developed for exposure of the identified receptor populations to COPCs in media associated with complete or hypothetically-complete exposure pathways. As previously discussed, estimates of human uptake were calculated using the 95th UCL of lognormally transformed datasets. The estimated carcinogenic risks and noncarcinogenic hazards were compared to the EPA guidelines and generally-accepted target risk levels presented above. Carcinogenic risks within or exceeding the target range of 1 x 10^{-6} to 1 x 10^{-4} and non-carcinogenic hazards greater

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than 1 (1.0E+00) are identified in this section. Scientific notation is used in the discussion of both these risks.

The result of this evaluation concluded that most of the chemicals detected in groundwater, soil, and sediment are not associated with an excess health risk for the current or future land use scenarios evaluated. Tables 9.1 through 9.7 present the carcinogenic and non-carcinogenic risk estimates for the exposure pathways evaluated.

5.4.1 Current Land Use

Based on the inactive status of the VICHEM Site, current land use scenarios evaluated exposure to onsite surface soil and soil/sediment in the Gut System for an adult and pre-adolescent trespasser. The cancer risk estimates presented are associated with exposure to arsenic and chromium, which are the only carcinogenic COPCs identified in onsite surface soil and soil/sediment in the Gut System. In addition to these two constituents, noncancer hazards were evaluated for iron (surface soil and soil/sediment) and manganese (surface soil). These risk estimates are discussed below and presented in Tables 9.1 and 9.2.

5.4.1.1 Adult Trespasser

For the adult trespasser, RME to COPCs in surface soil resulted in a carcinogenic risk estimate (total of all pathways) of 1×10^{-6}, which equals the lower end of EPA's benchmark range. This receptor's exposure to COPCs detected in the soil/sediment in the Gut System are below EPA's target risk at 3×10^{-7}. The cumulative risk for this receptor (total of all pathways and media) is 1×10^{-6} which equals the 10^{-6} carcinogenic risk benchmark. The CT carcinogenic risks were calculated for surface soil and the CT risk of 1×10^{-7} is below the EPA benchmark.

Noncancer hazard estimates for the RME receptor were less than the target level of 1 for exposure to COPCs in onsite surface soil and soil/sediment in the Gut System with an overall cumulative HI of 7.7E-02. Because the RME noncancer HIs were less than 1, the CT receptor was not evaluated.

5.4.1.2 Pre-Adolescent Trespasser

None of the individual pathway (*i.e.*, ingestion, dermal contact, and inhalation) risk estimates nor the cumulative RME risk estimate of 5×10^{-7} associated with exposure to onsite surface soil evaluated for the pre-adolescent trespasser exceed EPA's 10^{-6} point of departure for acceptable carcinogenic risk. Carcinogenic risk estimates calculated for exposure to COPCs in soil/sediment in the Gut System were less than EPA's benchmark of 10^{-6} at 1×10^{-7}. The pre-adolescent trespasser's overall cancer risk estimate (contact with COPCs in onsite surface soil and Gut System soil/sediment via ingestion, inhalation, and dermal pathways) is 7×10^{-7} which is less than 10^{-6}. It was not necessary to evaluate the CT receptor for this scenario.

Individual noncancer hazard estimates were less than the target level of 1 for pre-adolescent trespasser exposure to COPCs in onsite surface soil and soil/sediment in the Gut System. As

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presented in Table 9.2, the overall HI across all media and exposure routes is 2.4E-01. It was not necessary to evaluate the CT receptor for this scenario.

5.4.2 Future Land Use

Considering the current and anticipated future industrial zoning classification of the VICHEM Site, future land use scenarios evaluated exposure to COPCs in groundwater, surface soil, and soil/sediment in the Gut System for an adult industrial/commercial worker. In addition, a future construction scenario was evaluated for direct contact exposure with COPCs in surface soil. Subsurface soil was not evaluated for the construction worker because no COPCs were identified in this medium. However, the potential risk associated with leaching of constituents via groundwater migration through subsurface soil was evaluated by comparing concentrations to EPA's SSLs. The results of this evaluation are discussed in Section 4.0 of the RI Report. Finally, an offsite resident was evaluated for direct contact (dermal contact, ingestion) with COPCs and inhalation of volatile COPCs in groundwater.

Exposure to groundwater was evaluated for the onsite industrial worker, assuming this receptor would use groundwater from an onsite well for potable and non-potable purposes. The pathways evaluated for exposure to COPCs in groundwater included ingestion, dermal contact, and inhalation of VOCs. Offsite residential exposure to groundwater was evaluated based on the future potential for COPCs in onsite groundwater to migrate to offsite wells. The pathways evaluated include exposure to COPCs in groundwater via ingestion of groundwater from the tap, and dermal contact and inhalation while showering (adult) or taking a bath (child). For the purpose of this HHRA, it was assumed that current onsite groundwater concentrations were representative of future offsite concentrations. The probability that groundwater concentrations will be the same offsite as they are onsite is uncertain, as the concentrations offsite will likely be affected by many chemical-specific factors such as natural attenuation, degradation, and mobility. However, this assumption was made for the purposes of this risk assessment. A discussion on environmental fate and transport as it relates to this HHRA is presented in the Qualitative Uncertainty Section 5.6.2. As previously discussed, exposure to groundwater was not considered for the construction worker.

Like current land use scenarios, the cancer risk estimates presented for surface soil and soil/sediment in the Gut System are associated with exposure to arsenic and chromium which are the only carcinogenic COPCs identified in these media. In addition, noncancer hazards were evaluated for aluminum (soil/sediment), iron (surface soil and soil/sediment), manganese (surface soil and soil/sediment), vanadium (surface soil and soil/sediment), and zinc (surface soil). These risk estimates are discussed below and presented in Tables 9.3 and 9.4.

5.4.2.1 Industrial/Commercial Worker

The hypothetical industrial/commercial worker receptor was evaluated for potential risk associated with exposure to COPCs in groundwater, surface soil, and soil/sediment collected in the Gut System. The cumulative RME risk estimate of 9×10^{-4} exceeds the target range of 1×10^{-6} to 1×10^{-4}. The majority of the potential carcinogenic risk is associated with exposure to

COPCs in groundwater as shown in Table 9.3a. In particular, inhalation of volatilized chloroform, exposure to chloroform and arsenic via ingestion, and dermal contact with chloroform account for most of the cumulative risk estimate for this medium. Onsite surface soil exposures for the RME scenario exceed the lower end of EPA's target range with estimates of 3×10^{-6}. Exposure to the Gut System soil/sediment yielded a risk estimate of 6×10^{-7}, less than the EPA benchmark risk estimate. The carcinogenic risks from these media are associated with arsenic.

CT risk estimates for the industrial onsite worker are greater than the high end of EPA's acceptable target risk range. The cumulative risk estimate for this receptor is 2×10^{-4} which, like the RME, is comprised almost entirely of risk associated with exposure to COPCs in groundwater. Again, inhalation of volatilized chloroform contributes essentially all of this risk with an associated cancer risk estimate of 2×10^{-4}. Surface soil risk estimates for the CT receptor did not contribute significantly with a cumulative pathway risk estimate of 5×10^{-7}.

For the RME receptor, the only noncarcinogenic hazards exceeding 1 are associated with exposure to COPCs in groundwater. The majority of this hazard estimate is associated with inhalation of volatilized chloroform with a HQ of 3.3E+02. The cumulative ingestion HQs associated with groundwater yield a hazard quotient of 2.7E+00. Target organ HIs across all media are 3.3E+02 for liver/kidney, 5.8E-02 for decreased hair proteins, 7.3E-02 for skin, 1.2E+00 for CNS, 1.0E-01 for blood effects, 5.8E-01 for liver/heart/pancreas, 7.1E-02 for lung effects, and 6.1E-.3 for GI tract. The cumulative HI associated with exposure to groundwater is 3.3E+02 (99% of which is associated with inhalation of volatiles in groundwater).

Evaluation of the CT receptor provided similar results as the RME (cumulative groundwater HI values greater than 1) since inhalation of chloroform is responsible for most of the non-carcinogenic risk and inhalation rates were not varied between the two receptors.

Since RME exposures to surface soil and soil/sediment in the Gut System did not generate non-carcinogenic hazard estimates greater than the target benchmark, CT receptors to these media were not evaluated. Risk estimates for the RME receptor are presented in Table 9.3a showing HI of 3.1E-01 for surface soil and 6.1E-02 for soil/sediment.

5.4.2.2 Construction Worker

The total risk estimate associated with exposure to arsenic in surface soil and soil/sediment for the construction worker (9×10^{-7}) is less than EPA's 10^{-6} target risk. This result indicates no significant risk for this receptor under the future construction scenario evaluated. Direct contact exposure to subsurface soil was not evaluated since there were no COPCs identified in this medium.

Ingestion non-cacinogenic hazard estimates for the RME construction worker were slightly greater than one for ingestion of onsite surface soils (1.2E+00). Across all media no individual COPC was greater than one, but the cumulative HI was 1.8E+00, indicating a slight potential for adverse health effects. The total CT HI was 2.5E-01.

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5.4.2.3 Adult Resident

The adult offsite resident was evaluated for potential risk associated with exposure to COPCs in groundwater. The cumulative RME risk estimate, 8×10^{-4}, exceeds the EPA target risk range of 1×10^{-4} to 1×10^{-6}. The majority of the potential risk comes from chloroform via ingestion and inhalation, and arsenic via the ingestion pathway. The CT estimate for this scenario is 9×10^{-5}, and falls within the EPA benchmark risk range.

For the non-carcinogenic evaluation, the cumulative RME hazard of 2.5E+02 exceeded the acceptable level of 1. Exposure via inhalation and ingestion contributed to the majority of the hazard. Specifically, individual HIs for inhalation of chloroform (2.5E+02) and the ingestion of chloroform (2.8E+00), iron (1.1E+00), and manganese (2.7E+00) in groundwater all exceeded 1. Target pathway HIs exceeding 1 included liver/kidney (2.5E+02), CNS, (2.8E+00), and liver/heart/pancreas (1.2E+00).

The cumulative CT hazard across groundwater is 8.2E+01, to which chloroform (1.7E+00) and manganese (1.5E+00) each contributed via the ingestion pathway, and chloroform contributed the majority via inhalation (7.8E+01).

Risk and hazard estimates for the adult resident are presented in Tables 9.5a and 9.5b.

5.4.2.4 Child Resident

The child offsite resident risk estimate, 4×10^{-4}, exceeds the EPA target risk range. Major contributing COPCs were similar to those for the adult scenario. The CT risk estimate was also calculated, and just fell within the EPA target risk range at 1×10^{-4}.

For the non-carcinogenic evaluation, the total HI RME estimate was 6.0E+02. COPCs contributing to the majority of hazard were chloroform via ingestion (8.3E+00) and inhalation (5.8E+02), manganese via ingestion (7.7E+00), and iron via ingestion (3.2E+00). Pathway-specific HIs that exceeded one included liver/kidney (5.9E+02), CNS (8.0E+00) and liver/heart/pancreas (3.3E+00). The total HI CT estimate was 2.0E+02.

5.4.2.5 Addition of the Adult and Child Resident

EPA guidance (1989) recommends that adult and child carcinogenic risk-estimates are combined to derive an overall lifetime cancer risk. As presented above, the total risk estimates for both the child and adult-exceeded EPA's target risk range, in most cases. The cancer risks for the adult and child resident were summed using the data presented in Tables 8.19a, 8.20a, 8.21a and 8.22a (RME) and 8.19b, 8.20b, 8.21b, and 8-22b (CT). The cumulative risk for the adult and child resident under an RME scenario is 1×10^{-3} and under the CT scenario is 2×10^{-4}. The driving pathways and chemicals are consistent with the adult and child risk estimates. The summary of these risks are presented in Tables 9.7a and b.

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5.5 RISK DRIVERS

This section presents a summary of cancer risks and noncancer hazards that may trigger the need for cleanup at the VICHEM Site. Risks and hazards are presented for each receptor by medium, exposure route, and exposure point. Only those chemicals in media which exceed or significantly contribute to an exceedance of the target levels are presented herein. The risk drivers are summarized in the Table 10 series. Based on USEPA guidance, the target cancer risk is 1×10^{-6} to 1×10^{-4}, and the target hazard level is 1 (EPA, 1989). Any data not presented in the Table 10 series is not considered to be risk-driving.

5.5.1 Current Land Use

As shown in Table 10.1, arsenic is surface soil presents a potential for slight carcinogenic risk at 1×10^{-6} (the lower end of the EPA target risk range).

5.5.2 Future Land Use

The exposure scenarios presented in this section represent only those with risk or hazard estimates that exceed the target levels. Within each scenario presented, only those chemicals and pathways which contribute significantly to an increased risk or hazard level are presented. Based on the scenarios evaluated for future land use, the chemical which is the main driver of hazard and risk at the site is chloroform in groundwater. Manganese and iron also present an increased hazard in groundwater, as does iron in surface soil and soil/sediment in the gut system.

5.5.2.1 Adult Trespasser

As presented in Table 10.1, the RME chemical risk driver for this scenario is arsenic in surface soil. No one exposure pathway exceeds 1×10^{-6}, however, carcinogenic risk from the combined ingestion and dermal pathways is 1×10^{-6}.

5.5.2.1 Industrial/Commercial Worker

As presented in Table 10.2a, the RME chemical risk driver for this scenario is chloroform in groundwater. The potential future risk from inhalation of chloroform in groundwater is 9×10^{-4}, and comprises 95% of the carcinogenic risk to this receptor. Exposure pathways involving chloroform, methylene chloride and arsenic are also presented in Table 10.2a, as they generally contribute to the overall risk level of 9×10^{-4} for this scenario. CT exposure estimates, presented in Table 10.2b, yield a cancer risk of 2×10^{-4}, with the major contributor also being chloroform in groundwater.

Ninety-nine percent of this total HI (3.3E+02) for the industrial/commercial worker is due to inhalation of chloroform in groundwater. HIs due to ingestion and dermal contact of both chloroform (1.2E+02) and manganese (1.2E+00) in groundwater are also elevated. CT estimates show similar results, with the inhalation of chloroform being the main risk driver of hazard.

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Ingestion of chloroform, iron and manganese in groundwater comprise a total hazard quotient of 1.4E+00.

5.5.2.2 Construction Worker

The theoretical cancer risk levels for the construction worker falls within the acceptable risk range. The drivers of hazard for this scenario are arsenic, iron, and manganese in surface soil via the ingestion and dermal pathways. No one exposure pathway exceeds 1, however, the combined pathway HI equals the EPA benchmark of 1.0E+00. This information is presented in Table 10.3.

5.5.2.3 Adult Resident

Table 10.4a presents the RME risk drivers for the theoretical future adult resident scenario. Overall risk at the site is 8×10^{-4}. Chloroform, methylene chloride and arsenic in groundwater are the major contributors for this scenario. CT risk estimates were within the acceptable risk range at 9×10^{-5}.

As presented in Table 10.4a, the chemical and pathway which contribute most to the increased hazard index for the adult resident is chloroform in groundwater (HI = 2.5E+02), comprising 98% of the total hazard for this scenario. Iron and manganese also present unacceptable hazard levels of 1.1E+00 and 2.7E+00, respectively, via potential ingestion of groundwater. CT estimates (Table 10.4b) indicate that chloroform is the main driver of hazard, and that manganese also presents and unacceptable level of hazard via ingestion (1.5E+00).

5.5.2.4 Child Resident

Table 10.5a presents the RME child resident risk drivers and as with the adult resident, chloroform, methylene chloride and arsenic are the COPCs with risks greater than 1×10^{-6}. The risk for the CT scenario is 1×10^{-4}. As with the adult resident, inhalation of chloroform in groundwater presents the greatest percentage of hazard (HI = 5.8E+02; 97% of the total HI). Chloroform also presents an increased hazard due to ingestion (HI = 8.3E+00), as do iron (3.2E+00) and manganese (7.7E+00). CT hazard drivers are presented in Table 10.5b. The chemical drivers for the CT exposure are the same as for the RME scenario, with chloroform, iron, and manganese all having individual HIs greater than 1.

5.5.2.5 Addition of Adult and Child Resident

Table 10.6a presents the RME adult plus child resident carcinogenic risk drivers. EPA guidance (1989) recommends that adult and child risk-estimates are combined to derive an overall lifetime cancer risk. Inhalation is the major risk driver while ingestion of chloroform, methylene chloride and arsenic all contribute to risk. For the CT scenario, the risk drivers are the same as those for the RME scenario.

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5.6 QUALITATIVE UNCERTAINTY ANALYSIS

The primary objective of the uncertainty analysis is to determine the extent to which the risk results may be over- or underestimated, and to identify the uncertainties associated with these estimates. While risk estimates calculated using quantitative risk assessment methodologies offer plausible estimates of the upper bound of risk, such estimates are not actual predictions of risk. In order to effectively understand a risk assessment, quantitative estimates of risk must be evaluated in conjunction with important qualitative factors. These factors include the strength of the evidence which indicates that a substance produces a particular toxic effect, the accuracy and completeness of the site-specific data used to determine potential exposures, and uncertainties and assumptions inherent to the assessment of risk. The risk assessment does not characterize absolute risk; rather, it seeks to highlight potential sources of unacceptable risk so that they may be effectively addressed.

For the Reasonable Maximum Exposure (RME) receptor, assumptions regarding chemical toxicity, site characteristics, and human exposure potential are selected and applied such that the estimated risks and hazards are based on the reasonable maximum exposure expected to occur under both current and future use scenarios. Under these conditions, the RME represents a conservative estimate of exposure which is still within the range of possible exposures (EPA, 1989). For the Central Tendency (CT) receptor, assumptions regarding exposures are based upon realistic scenarios other than the RME scenario. These exposures tend to also be conservative although less than those used for the RME scenario. The assumptions for the CT scenario are based upon average or mean estimates of exposure from using studies such as those presented in the Exposure Factors Handbook (EPA, 1997).

Some assumptions are based on defensible scientific research, while others rely on professional judgement. Assumptions based on strong scientific evidence, epidemiologic studies, or site-specific information contribute less uncertainty to the process, while assumptions which rely on professional judgement often contribute more uncertainty. As stated in Section 3.2, four elements must be present for an exposure pathway to be complete. These elements were either identified as present or had the potential to be present in the exposure pathways included in this risk assessment. Estimating potential risks and hazards resulting from exposure via these pathways involves using mathematical models, and includes information based on current knowledge of biology, chemistry, and toxicology. The assumptions used in the models are based on information gathered from national epidemiologic studies as well as site specific information regarding land use and human activity. Some of the assumptions that introduce uncertainty into the risk assessment process are described below.

5.6.1 Representative Chemical and Exposure Point Concentrations

There are a number of uncertainties associated with developing exposure point concentrations (EPCs) for use in risk assessments. The use of the 95th UCL is a conservative way to estimate the exposure concentration of a Contaminant of Potential Concern (COPC). As stated in the RAGS supplemental guidance (EPA, 1992b), "Because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence level (UCL)

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of the arithmetic mean should be used for this variable *[the EPC]*. The 95 percent UCL provides reasonable confidence that the true site average will not be underestimated."

The procedure used in selecting EPCs is consistent with the RAGS supplemental guidance. Since all the Site data were not normally distributed, the 95th UCL on the mean of the log-transformed data was calculated for some of the COPCs. In accordance with guidance (EPA, 1992b), the maximum detected concentration was used to represent the EPC when the calculated 95th UCL exceeded the maximum. Otherwise, the 95th UCL was used to represent EPCs for the RME and CT receptors. All EPCs were based upon this RME approach, i.e., separate, less conservative EPCs were not developed for use in the CT risk calculations.

Inherent in the 95th UCL calculation is a conservative approach to addressing non-detected results for samples within a medium of concern. In accordance with guidance (EPA, 1992b), a concentration equal to one-half of the reporting limit was assumed for those samples where COPCs were not detected. For some COPCs, the number of samples with non-detected results surpassed the number of samples where the constituent was detected. It should be noted that this is a conservative assumption that may overestimate the EPC because many constituents are detectable at one-half the reporting limit.

Uncertainty associated with EPCs also may be related to sampling methods and locations. Surface soil samples were collected at the VICHEM Site at a depth of 0 to 1-ft bgs. Aside from the onsite worker performing landscaping or other forms of intrusive soil work, the industrial/commercial worker is more likely to be exposed to those COPCs present in only the top few inches of soil. As such, the dataset representing a depth of 0 to 1-ft bgs may not accurately represent the surface soil EPCs for future onsite workers.

5.6.2 Environmental Fate and Transport

Migration and dilution of chemicals in groundwater present additional sources of uncertainty in the HHRA. While it is improbable that any of the COPCs are completely resistant to degradation, the chemical reactions that cause degradation are sufficiently complex as to disallow calculation of chemical- and Site-specific degradation rates. Consequently, EPCs do not account for natural decay over time. This is conservative for the site COPCs, which are generally expected to experience degradation and natural attenuation. Also, because groundwater movement is dynamic within an aquifer, concentrations of COPCs will not remain static at a given monitoring well throughout a 30-year period. For the purposes of this HHRA, however, it was assumed that chemical concentrations in groundwater will remain constant over the entire exposure period.

Data from on-Site wells have been used to evaluate exposure for a future off-site resident conservatively assuming that the COPCs would migrate off-Site in a direction within the same hydrostratigraphic zone and that the concentrations will not change (i.e. no dilution). Current data indicate that COPCs are not present in offsite groundwater supply wells. Although fate and transport mechanisms such as natural attenuation and degradation make it highly unlikely for offsite concentrations to be the same as those onsite, onsite concentrations provide a conservative

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approach to assessing the future groundwater use scenario. As such, use of the on-Site data likely results in over estimation of potential future risks and hazards.

Degradation of some COPCs could theoretically result in constituents that are more toxic than those evaluated during the risk assessment. With respect to this Site, chloroform could successively degrade into methylene chloride, chloromethane, and methane. Methylene chloride and chloromethane, which is a gas, both degrade rapidly (Howard, 1991) and are therefore not expected to be persistent in the environment. Methylene chloride has been measured in Site samples[1], but its apparent presence is an artifact caused by blank contamination. The other major COPCs, ethylbenzene and xylene, degrade to carbon dioxide and water, which are non-toxic.

5.6.3 Exposure Assumptions

Several assumptions relating to the exposure assessment may not, in fact, reflect actual conditions at this Site and, as a result, add additional uncertainty to the risk results.

5.6.3.1 Completeness of Exposure Pathway

Some of the exposure pathways evaluated may not be complete. That is, exposure is not possible in the absence of any one of the following four elements: (1) source and mechanism of chemical release to the environment; (2) an environmental transport medium; (3) a point of potential human contact with that medium; and (4) a human contact route at the contact point. In this case, the presence of the potentially-exposed populations considered in this HHRA is hypothetical. For example, the assumption that adults and pre-adolescents trespass onsite and in the Gut System may not be accurate.

Similarly, it is possible that the future exposure scenarios described in the risk assessment may not become complete pathways in the foreseeable future. For example, the pathway presenting exposure of the future industrial/commercial worker produced incremental risk estimates that are considered significant based on the target comparison range. However, this receptor is hypothetical and it is possible that future industrial use of the Site would not use onsite wells as a potable water source. Likewise, risk and hazard estimates indicated potential health effects to an offsite resident. However, the residential groundwater use scenario also may never be complete. Although no COPCs currently exist in offsite groundwater, the future residential scenario is based on the assumption that COPCs *will* exist in offsite groundwater in the future at concentrations consistent with those detected during the remedial investigation.

Additionally, the pathway that evaluates industrial/commercial exposure to groundwater via inhalation of volatile COPCs uses a volatilization factor that was developed to represent a residential scenario where water is used for cooking, cleaning, and showering. This is likely to overestimate the exposure that would be encountered in an industrial setting where inhalation of COPCs in water is assumed to be limited to water use activities such as hand washing, toilet flushing, car washing, or landscaping (*i.e.*, watering lawn and plants at the facility).

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[1] The apparent concentrations also do not pose a risk in excess of the EPA target risk range.

5.6.3.2 Human Behavior

For the RME scenarios, conservative values were employed to describe human behavior. For example, it was assumed in the industrial/commercial scenario that an individual worker would be exposed to the same chemical concentration for 25 years. This assumption does not allow for the possibility of changes in job-site or responsibilities. For the trespasser scenarios, it was assumed that an adult or a preadolescent would trespass on the property twice a week for 4 hours per day for 52 weeks of the year. In addition, the adult was assumed to maintain this level of trespassing activity for 30 years. These exposure assumptions would tend to overestimate the carcinogenic and non-carcinogenic risks to the adult receptor.

Additional uncertainty at the VICHEM Site may be associated with water consumption rates. Due to the warm climate of St. Croix, it is possible that a worker onsite would consume more water per day while working in a tropical climate, than a worker located in a more temperate environment. Therefore, the RME ingestion rate of 1.2 L/day could potentially underestimate exposure for this Site, particularly for an outdoor worker.

For the shower model, it was assumed that a person would shower for 12 minutes and would remain in the enclosed bathroom for an additional 20 minutes following the shower. During this time, no ventilation would occur (i.e., windows would not be opened and an exhaust fan would not be used). These are conservative assumptions that would tend to over estimate the potential risks and hazards to a future resident.

5.6.3.3 Chemical Exposures other than Site-related

The exposure scenarios developed for this risk assessment do not account for exposure to chemicals not related to the Site, such as on-the-job exposure to workplace chemicals or household use of chemicals. Acceptable risk benchmark values were not adjusted to allow for exposures to chemicals originating offsite. If exposure to non Site-related chemicals is found to be significant, additive risks for chemicals that are similar or have similar target health endpoints as those onsite could possibly exceed acceptable risk benchmarks.

5.6.4 Soil Ingestion Rate

The current default value for soil ingestion for a construction worker is 480 mg/day. This number was originally derived from the qualitative estimate by Hawley (1985). However, most of Hawley's assumptions, including those for outdoor soil ingestion by an adult, were qualitative "guesstimates". Hawley's soil ingestion rate is based on an estimated soil-skin adherence factor of 3.5 mg/cm^2 for the forefingers and thumbs of one adult and the assumption that hand-to-mouth contact occurs, resulting in soil ingestion. EPA's Superfund program recommends the use of an ingestion rate for a construction worker that is based on the Hawley study. Until additional studies have been reviewed and the ingestion rate revised, the value of 480 mg/day will be used as the default ingestion rate for the construction worker. Consequently, it is possible that the risks and hazards calculated for the construction worker are overestimated.

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5.6.5 Dermal Absorption

To account for dermal absorption of COPCs in soil and sediment, a dermal absorption factor (DABS) is incorporated into the risk calculation. As discussed in RAGS Dermal Risk Assessment interim Guidance, (EPA, 1998), chemical-specific DABS values are available for only a limited number of analytes. Of the COPCs evaluated in surface soil and the Gut System soil/sediment, a chemical-specific DABS is available for arsenic only. Therefore, arsenic is the only chemical which is quantitatively evaluated for dermal exposure in this HHRA.

Chromium, iron, manganese, vanadium, and zinc are COPCs present in media that have the potential to create a complete dermal exposure pathway. However, these metals do not have EPA-approved DABS, and as a result, dermal exposure to these chemicals was not quantified in this HHRA. The omission of this pathway of exposure for these metals results in an underestimation of the total risk and hazards, especially for dermally active chemicals.

Similarly, dermal absorption of COPCs in groundwater requires the use of a permeability coefficient, which is the measure of the rate at which a chemical crosses or permeates the skin. Chemical-specific permeability coefficients were not available for the five inorganic COPCs (antimony, barium, iron, manganese, and vanadium) that were quantitatively evaluated for potential risk associated with dermal exposure to groundwater. According to data presented by EPA (1992a), small ions such as metals have a permeability coefficient equivalent to water at 1 x 10^{-3} cm/hr; therefore, this value was used for these metals.

5.6.6 Inhalation

For the future residential use scenario for groundwater, air concentrations of volatile COPCs were estimated using a simple showering model based upon Andelman (1990) and Schaum et. al (1994). The model uses groundwater concentrations and estimates the COPC concentrations in air during and immediately following showering. Attachment 2 provides a summary of the calculations used to estimate air concentrations. As noted by Schaum, et. al., (1994) "the assumptions of constant volatilization and no ventilation tend to make this model very conservative; that is, it is likely to overestimate actual levels." Additional assumptions made by this model include the following:

- The concentration of the chemical contaminant is assumed to be zero at the start of the shower;
- The exchange between air in the shower chamber and bathroom air is so rapid that the combined volume of the two compartments can be treated as a single chamber with a single concentration of volatilized chemical; and,
- The model does not account for the exchange rate that occurs when an exhaust fan is turned on.

The air concentrations derived from the shower model were also used to calculate potential inhalation risks and hazards for the future residential child receptor. The shower model results are conservative and may tend to overestimate the levels for the child bathing scenario.

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5.6.7 Noncarcinogenic Toxicity Criteria

Reference doses are developed by USEPA and other regulatory health agencies using conservative assumptions regarding the potential non-carcinogenic effects that exposure to specific chemicals may have on the human body. In developing the reference doses certain assumptions are made to ensure that exposure at that dose would not result in adverse health effects.

In addition to the uncertainty inherent in the derivation of No Observed Adverse Effect Levels (NOAELs) and Lowest Observed Adverse Effect Levels (LOAELs), development of noncarcinogenic health criteria must account for such things as human variability, use of subchronic studies to derive chronic health criteria, and differences in sensitivity between individuals within the exposed population. In an effort to compensate for such uncertainties in a health protective manner, uncertainty factors are applied by EPA to the NOAELs selected for derivation of the RfD or RfC. Depending on the quality and extent of toxicity information, varying degrees of uncertainty will be associated with the calculated toxicity values.

For example, the uncertainty factor for 2,4-dimethylphenol is 3,000 indicating a lack of confidence in the toxicity data upon which it is based. In contrast, the uncertainty factor for arsenic is only 3, indicating that there is a high degree of confidence in the data. In general, the procedures used to extrapolate from animals to humans in toxicity studies include the use of an uncertainty factor to account for interspecies variability. As discussed in Section 4.1, it is widely accepted in the scientific community that low doses of toxicants may be detoxified by any one of several processes present in human organ-systems (Ames et al., 1987). As a result, humans may not react to the same degree as the population of genetically homogeneous laboratory animal populations used in standard bioassays.

In addition to the uncertainty factor, a modifying factor is applied. This factor can range from less than 0 to 10, and is included to reflect a qualitative professional assessment of additional uncertainties in the critical study and in the entire database for the chemical not explicitly addressed by the preceding uncertainty factors. The default value for the modifying factor is 1 (USEPA, 1989b).

Consequently, the non-carcinogenic toxicity factors obtained from IRIS, HEAST and NCEA are generally accepted industry-wide as being conservatively protective of human health. The hazard quotients calculated for each given pathway were summed to provide a single hazard index for that pathway. The use of a single hazard index is conservative because not all COPCs affect the same target organ. Consequently, the breakdown of hazard indices by target organ better represents potential noncarcinogenic affects to humans.

5.6.8 Carcinogenic Toxicity Criteria

Usually, the level of uncertainty is larger for carcinogens than non-carcinogens due to inherent uncertainties in development of the cancer slope factors (SFs). SFs calculated by EPA are based on the Linear Multistage (LMS) model, which assumes that risk can be extrapolated in a linear

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manner from the high doses used in animal bioassays to the low doses characteristic of human environmental exposures. The use of the LMS model does not account for the concepts of threshold dose, initiation/promotion, and epigenetic mechanisms of carcinogenesis. As such, SFs are considered to represent potential risks at the 95th UCL. The accuracy of risk estimates at low doses predicted by the LMS model is unknown, but the risks associated with low levels of environmental exposure may actually be closer to zero than to estimated values.

In the absence of evidence of synergistic or antagonistic effects of chemical mixtures, the assumption was made, in accordance with EPA guidance, that their effects are additive. This assumption, however, does not account for dissimilarities in mechanisms of action. Furthermore, compounds may actually induce different toxic effects in different species or in different systems within a given species.

5.6.9 Absence of Chemical or Route-Specific Toxicity Values

No toxicity criteria (RfDs or cancer slope factors) have been developed to evaluate dermal routes of exposure. In the absence of route-specific toxicity values for dermal exposure, EPA (1989) recommends use of oral toxicity values, adjusted to reflect absorbed rather than administered dose, for assessment of potential health effects associated with dermal exposure. It is widely acknowledged that there is significant uncertainty in use of route-to-route extrapolation procedures in the risk assessment. One of the sources of uncertainty is the difference in toxicokinetics, (*i.e.*, absorption, metabolism, and mode of action that may affect the expression of toxicity between different routes of exposure). In this assessment, procedures recommended in EPA risk assessment guidance (EPA, 1989) were applied in route-to-route extrapolation, despite the uncertainty associated with these methods. The absorption factors applied were selected from published literature regarding GI absorption.

In addition, although toxicity information is generally available for the site COPCs, there may be some chemicals for which little toxicological data exist or that have no calculated toxicity factors (*i.e.*, RfD or CSF) for specific exposure routes. In the absence of data, the possibility exists that these chemicals may in fact pose some level of risk if exposures were to occur. In this respect, there may be an understatement of the total potential risks and hazards at the Site. For example, several constituents (arsenic, iron, vanadium, zinc, acetone, isophorone, xylenes, 2,4-dimethylphenol, and 2-methylphenol) were identified as COPCs for which inhalation toxicity factors do not exist. Consequently, they were not evaluated for their contribution to noncarcinogenic hazard

5.6.10 Lead as a COPC

Of the chemicals investigated in this HHRA, lead is the only Site constituent lacking the toxicity criteria required to develop a quantitative estimate of the potential for non-carcinogenic and carcinogenic effects associated with its exposure. As such, it is typically addressed separately from other chemicals in a risk assessment, and its presence in onsite groundwater is discussed qualitatively here. Lead, which was identified as a COPC for groundwater, was detected in five of 24 groundwater samples. Only the maximum detected concentration of 50.7 ppb detected in an

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off-site well (MW-10) exceeded the treatment technology action level (TTAL) of 15 ppb. Although this level is not representative of site-specific lead concentrations, both the average lead concentration (4.1 ppb) and the 95% UCL lead concentration (7.3 ppb) were calculated including this value, but do not exceed the TTAL. Furthermore, the average lead concentration is similar to the background default concentration of 4 ppb utilized in the IEUBK model from drinking water exposure. Therefore, although lead is identified as a COPC in groundwater, it was not quantitatively evaluated through the use of a biokinetic model, and the concentrations present onsite are not expected to pose an unacceptable health risk.

5.7 RISK CHARACTERIZATION SUMMARY

The risks and hazards are summarized in this last section of the HHRA. When evaluating the calculated risks presented here, one should remember that the lack of toxicity information for specific chemicals and certain exposure pathways may have potentially underestimated the risk and hazards at the site.

As previously discussed, based on the exposure assumptions utilized in developing risk estimates, the hypothetical industrial/commercial occupational exposure to groundwater under a future land use scenario is the only on-Site pathway that presents cumulative risk estimates, for both the RME and CT receptors, in excess of EPA's target acceptable range. Concentrations of chloroform in groundwater are responsible for the majority of this risk.

Onsite surface soil and soil/sediment in the Gut System demonstrated carcinogenic risks for the adult industrial worker in excess of 10^{-6} for ingestion at 3×10^{-6}; however, this risk estimate is within EPA's acceptable range of 10^{-6} to 10^{-4}. This risk was associated primarily with ingestion of arsenic in soils.

Estimated risks for adult and pre-adolescent trespassers and construction workers are at or below the EPA target of 10^{-6} risk.

The RME risk estimates for potential future residential groundwater use exceeded the EPA range for adult and child receptors. For both residential scenarios, the COPCs which contributed to the majority of risk are chloroform and arsenic. Both adult and child residential RME HIs exceeded 1 (2.5E+02 and 6.0E+02, respectively). Ingestion and inhalation of chloroform contributed to the majority of the risk and hazard for the residential groundwater use scenario. Ingestion of arsenic, iron, and manganese also contributed to the risk and hazard estimates.

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ATTACHMENT A

Onsite Data and 95% UCL Calculations for COPCs

ATTACHMENT A
Onsite Groundwater Data and 95% UCL Calculation for COPCs
Virgin Island Chemical Site

Sample ID	MW-1	MW-1	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-3	MW-3
Sample Date	09-Jan-98	26-Mar-98	13-Jan-98	13-Jan-98	13-Jan-98	25-Mar-98	25-Mar-98	25-Mar-98	10/8/1998	10/8/1998	10/8/1998	10/20/1998	11-Jan-98	24-Mar-98
Sample Interval (ft bgs	23-33	23-33	18.9-28.2	Duplicate	DUP AVG	18.9-28.2	Duplicate	DUP AVG	18.9-28.2	Duplicate	DUP AVG	18.9-28.2	18.5-28.5	18.5-28.5
Acetone	7800 BJ	5100 R	440 BJ	250 BJ	345 BJ	260 BU	210 BUJ	260 BU	73	5 U	73	5 U	10.5 UJ	4 R
LN	8.96				5.84			5.56			4.29	1.61	2.35	
Chloroform	1000 U	1000 U	1500 J	1400 J	1450 J	2400	1900	2150	150	125	137.5	580 D	0.5 U	0.5 U
LN	6.91	6.91			7.28			7.67			4.92	6.36	-0.69	-0.69
Ethylbenzene	20000	18000	50 UJ	50 UJ	50 UJ	50 U	50 U	50 U	2.5 U	2.5 U	2.5 U	2.5 U	0.5 U	0.5 U
LN	9.90	9.80			3.91			3.91			0.92	0.92	-0.69	-0.69
Methylene Chloride	4300 BJ	250 BUJ	170 BJ	240 BJ	205 BJ	75 BUJ	17.5 BUJ	75 BUJ	2.5 U	2.5 U	2.5 U	2.5 U	1 UJ	0.4 BUJ
LN	8.37	5.52			5.32			4.32			0.92	0.92	0.00	-0.92
Xylene(total)	86000	80000	50 UJ	50 UJ	50 UJ	50 U	50 U	50 U		2.5 U	3.0 J	5 U	0.5 U	0.5 U
LN	11.36	11.29			3.91			3.91			1.10	1.61	-0.69	-0.69
m&p-Xylene									3 J		3 J	5 U		
LN											1.10	1.61		
o-Xylene									2.5 U		2.5 U	2.5 U		
LN											0.92	0.92		
Isophorone	54 J	75 J	2.5 U	2.5 U		2.5 U	2.5 U						2.5 U	2.5 U
LN	3.99	4.32	0.92	0.92		0.92	0.92						0.92	0.92
Arsenic	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U					2.2 B	3 B
LN	-0.36	-0.36	NA	NA	-0.36	NA	NA	-0.36					NA	NA
Lead	1.6 U	0.55 U	10.6	11.1	10.85	0.55 U	0.55 U	0.55 U					1.05 U	0.55 U
LN	0.47	-0.60	NA	NA	2.38	NA	NA	-0.60					0.05	-0.60
Manganese	2140 J	1990	56.4 J	50.7 J	53.55 J	118	120	119					3370 J	3570

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ATTACHMENT A
Onsite Groundwater Data and 95% UCL Calculation for COPCs
Virgin Island Chemical Site

Sample ID	MW-3	MW-4	MW-4	MW-5	MW-5	MW-6	MW-6	MW-7	MW-7	MW-7	MW-8	MW-8	MW-9	MW-9
Sample Date	15-Oct-98	09-Jan-98	23-Mar-98	12-Jan-98	24-Mar-98	13-Jan-98	26-Mar-98	13-Jan-98	25-Mar-98	08-Oct-98	14-Jan-98	26-Mar-98	12-Jan-98	25-Mar-98
Sample Interval (ft bgs	18.5-28.5	18-28	18-28	17.5-27.5	17.5-27.5	17.4-26.7	17.4-26.7	64-74	64-74	64-74	63-73	63-73	64-74	64-74
Acetone	96	1 UJ	2 BJ	1 UJ	0.6 R	5800 BJ	11000 R	1 UJ	2.5 BU	5 U	1 UJ	2 R	0.5 UJ	1.5 BUJ
LN	4.56	0.00	0.69	0.00		8.67		0.00	0.92	1.61	0.00		-0.69	0.41
Chloroform	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1000 U	1000 U	4 J	4	2.5 U	2 J	4	4	4
LN	0.92	-0.69	-0.69	-0.69	-0.69	6.91	6.91			0.92				
Ethylbenzene	2.5 U	0.5 U	0.5 U	0.3 J	0.5 U	22000	20000	0.5 UJ	0.5 U	2.5 U	0.5 UJ	17	0.5 U	0.5 U
LN	0.92	-0.69	-0.69	-1.20	-0.69	10.00	9.90	-0.69	-0.69	0.92	-0.69	2.83	-0.69	-0.69
Methylene Chloride	2.5 U	1 UJ	0.5 BUJ	1 UJ	0.5 BUJ	3400 BJ	340 BUJ	1 UJ	0.3 BUJ	2.5 U	1 UJ	1 BU	1 UJ	0.35 BUJ
LN	0.92	0.00	-0.69	0.00	-0.69	8.13	5.83	0.00	-1.20	0.92	0.00	0.00	0.00	-1.05
Xylene(total)	5 U	0.4 J	0.5 U	0.5 U	0.5 U	#####	98000	0.5 UJ	0.5 J	4 J	0.5 UJ	79	0.5 U	0.5 U
LN	1.61	-0.92	-0.69	-0.69	-0.69	11.61	11.49	-0.69	-0.69	1.39	-0.69	4.37	-0.69	-0.69
m&p-Xylene	5 U									4 J				
LN	1.61									1.386				
o-Xylene	2.5 U									2.5 U				
LN	0.92									0.916				
Isophorone		2.5 U	2.5 U	2.5 U	2.5 U	47 J	62 J	2.5 U	2.5 U		2.5 U	2.5 U	2.5 U	2.5 U
LN		0.92	0.92	0.92	0.92	3.85	4.13	0.92	0.92		0.92	0.92	0.92	0.92
Arsenic		0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U		0.7 U	2 B	0.7 U	0.7 U	0.7 U	0.7 U
LN		-0.36	-0.36	-0.36	-0.36	-0.36	-0.36		-0.36	NA	-0.36	-0.36	-0.36	-0.36
Lead		2.8 U	6.3	4.35 U	0.55 U	0.55 U	0.55 U		0.55 U	0.55 U	0.55 U	0.55 U	6.55 U	0.55 U
LN		1.03	1.84	1.47	-0.60	-0.60	-0.60		-0.60	-0.60	-0.60	-0.60	1.88	-0.60
Manganese		1810 J	1090	414 J	222	2660 J	2540		46 J	39	55.9 J	34.8	49.4 J	37.3

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Onsite Groundwater Data and 95% UCL Calculation for COPCs
Virgin Island Chemical Site

Sample ID	MW-10	MW-10	MW-11	MW-11	MW-11	MW-12	MW-13	MW-14	P-1	P-1	P-2	P-2	TW-1	TW-2
Sample Date	11-Jan-98	27-Mar-98	20-Oct-98	20-Oct-98	20-Oct-98	19-Oct-98	20-Oct-98	18-Oct-98	10-Jan-98	29-Mar-98	10-Jan-98	27-Mar-98	17-Sep-97	17-Sep-97
Sample Interval (ft bgs	22-32	22-32	30-40	Duplicate	DUP AVG	137-147	30-40	124-134	Unknown	Unknown	Unknown	Unknown	19-29	19-29
Acetone	0.5 UJ	1.5 BUJ	5 U	10.3	10.3	5 U	5 U	12	1.5 UJ	4 R	0.5 UJ	0.05 BUJ	NA	NA
LN	-0.69	0.41			2.33	1.61	1.61	2.48	0.41		-0.69	-3.00		
Chloroform	0.5 U	0.5 U	3 J	2.5 U	3 J	2.5 U	2.5 U	2.5 U	75 D	46 E	3	3	NA	NA
LN	-0.69	-0.69		0.92		0.92	0.92	0.92						
Ethylbenzene	0.5 U	0.4 UJ	1 J	2.5 U	1 J	2.5 U	1 J	2.5 U	0.5 U	0.25 UJ	0.5 U	0.5 U	8000 E	2.5 U
LN	-0.69	-0.92			0.00	0.92	0.00	0.92	-0.69	-1.39	-0.69	-0.69	8.99	0.92
Methylene Chloride	1 UJ	0.4 BUJ	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2 UJ	0.5 BUJ	1.5 UJ	0.35 BUJ	NA	NA
LN	0.00	-0.92			0.92	0.92	0.92	0.92	0.69	-0.69	0.41	-1.05		
Xylene(total)	0.5 U	2.5 U		6.13	6.13	5 U	4 J	5 U	0.5 U	1.5 U	0.5 U	3.5 U	15000 E	2.5 U
LN	-0.69	0.92			1.81	1.61	1.39	1.61	-0.69	0.41	-0.69	1.25	9.62	0.92
m&p-Xylene			5 J		5 J	5 U	4 J	5 U						
LN					1.609	1.609	1.386	1.609						
o-Xylene			0.5 J		0.5 J	2.5 U	2.5 U	2.5 U						
LN					-0.693	0.916	0.916	0.916						
Isophorone	2.5 U	2.5 U							2.5 U	2.5 U	2.5 U	2.5 U		
LN	0.92	0.92							0.92	0.92	0.92	0.92		
Arsenic	2.9 B	5.2 B							0.7 U	0.7 U	0.7 U	0.7 U		
LN	NA	NA							-0.36	-0.36	-0.36	-0.36		
Lead	3.6 U	50.7							2 B	0.55 U	8	0.55 U		
LN	1.28	3.93							NA	-0.60	2.08	-0.60		
Manganese	2900 J	3410							10.2 BJ	12.4 B	131 J	919		

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ATTACHMENT A
Onsite Groundwater Data and 95% UCL Calculation for COPCs
Virgin Island Chemical Site

Sample ID	TW-3	TW-3	TW-3	TW-4	TW-5	GWPP-7	GWPP-8	GWPP-9	GWPP-10	GWPP-11	GWPP-12	GWPP-13	GWPP-14	GWPP-15
Sample Date	19-Sep-97	19-Sep-97	19-Sep-97	19-Sep-97	23-Sep-97	27-Mar-98	27-Mar-98	29-Mar-98	30-Mar-98	29-Mar-98	30-Mar-98	31-Mar-98	01-Apr-98	02-Apr-98
Sample Interval (ft bgs	19-29	Duplicate	DUP AVG	22-32	20-30	20-25	20-25	22-27	28-33	21-26	26-31	22-30	21-24	8-10
Acetone	NA	NA	NA	NA	NA	12.5 U	12.5 U	125 U	12.5 U	12.5 U	12.5 U	10 U	12.5 U	12.5 U
LN						2.53	2.53	4.83	2.53	2.53	2.53	2.30	2.53	2.53
Chloroform	NA	NA	NA	NA	NA	5 U	5 U	330	94	74	78	157	5 U	1200
LN						1.61	1.61	5.80	4.54	4.30	4.36	5.06	1.61	7.09
Ethylbenzene	720	750	735	2.5 U	3 J	5 U	5 U	50 U	5 U	2.4 J	5 U	5 U	5 U	5 U
LN			6.60	0.92	1.10	1.61	1.61	3.91	1.61	0.88	1.61	1.61	1.61	1.61
Methylene Chloride	NA	NA	NA	NA	NA	5 U	5 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U
LN						1.61	1.61	3.91	1.61	1.61	1.61	1.61	1.61	1.61
Xylene(total)	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	10 U	10 U	100 U	10 U	14.6 J	10 U	10 U	10 U	10 U
LN			0.92	0.92	0.92	2.30	2.30	4.61	2.30	2.68	2.30	2.30	2.30	2.30
m&p-Xylene						10 U	10 U	100 U	10 U	8.6 J	10 U	10 U	10 U	10 U
LN						2.303	2.303	4.605	2.303	2.152	2.303	2.303	2.303	2.303
o-Xylene						5 U	5 U	50 U	5 U	6 J	5 U	5 U	5 U	5 U
LN						1.609	1.609	3.912	1.609	1.792	1.609	1.609	1.609	1.609
Isophorone														
LN														
Arsenic														
LN														
Lead														
LN														
Manganese														

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ATTACHMENT A
Onsite Groundwater Data and 95% UCL Calculation for COPCs
Virgin Island Chemical Site

Sample ID	GWPP-16	GWPP-17	GWPP-19	GWPP-20	GWPP-21	GWPP-23	GWPP-24	GWPP-25	GWPP-26	GWPP-27	GWPP-28	GWPP-29	GWPP-30	GWPP-31
Sample Date	03-Apr-98	03-Apr-98	03-Apr-98	03-Apr-98	03-Apr-98	04-Apr-98	05-Apr-98	05-Apr-98	05-Apr-98	05-Apr-98	08-Apr-98	08-Apr-98	09-Apr-98	08-Apr-98
Sample Interval (ft bgs	27-30	27-32	8-12	23-28	21-26	22-27	23-28	24-29	6-10	24-29	26-31	31-34	34-37	22-27
Acetone	110	12.5 U	12.5 U	12.5 U	12.5 U	12.5 U	62	12.5 U	12.5 U	1250 U	12.5 U	14 JB	15 J	110 U
LN	4.70	2.53	2.53	2.53	2.53	2.53	4.13	2.53	2.53	7.13	2.53	2.64	2.71	4.70
Chloroform	5 U	3 J	450	7 J	5 U	1000	53	3 J	53	3800	230	96	5 U	1700
LN	1.61	1.10	6.11	1.95	1.61	6.91	3.97	1.10	3.97	8.24	5.44	4.56	1.61	7.44
Ethylbenzene	5 U	5 U	3 J	2 J	2 J	5 U	5 U	2 J	5 U	500 U	5 U	5 U	5 U	25 U
LN	1.61	1.61	1.10	0.69	0.69	1.61	1.61	0.69	1.61	6.21	1.61	1.61	1.61	3.22
Methylene Chloride	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	5 U	5 U	5 U	25 U
LN	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	6.21	1.61	1.61	1.61	3.22
Xylene(total)	9 J	10 U	14 J	14 J	12 J	8 J	10 J	13 J	2 J	1000 U	10 U	10 U	20 U	50 U
LN	2.20	2.30	2.64	2.64	2.48	2.08	2.30	2.56	0.69	6.91	2.30	2.30	3.00	3.91
m&p-Xylene	6 J	10 U	9 J	8 J	7 J	5 J	6 J	8 J	10 U	1000 U	10 U	10 U	10 U	50 U
LN	1.792	2.303	2.197	2.079	1.946	1.609	1.792	2.079	2.303	6.908	2.303	2.303	2.303	3.912
o-Xylene	3 J	5 U	5 J	6 J	5 J	3 J	4 J	5 J	2 J	500 U	5 U	5 U	5 U	25 U
LN	1.099	1.609	1.609	1.792	1.609	1.099	1.386	1.609	0.693	6.215	1.609	1.609	1.609	3.219
Isophorone														
LN														
Arsenic														
LN														
Lead														
LN														
Manganese														

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ATTACHMENT A
Onsite Groundwater Data and 95% UCL Calculation for COPCs
Virgin Island Chemical Site

Sample ID	GWPP-32	GWPP-33	GWPP-34	GWPP-35	GWOR-1	GWPP-27A	GWPP-27A	GWPP-27A	GWPP-29A	GWPP-29A	GWPP-29A	GWPP-29A	GWPP-29A	GWPP-36
Sample Date	07-Apr-98	09-Apr-98	09-Apr-98	10-Apr-98	10-Apr-98	11-Oct-98	12-Oct-98	13-Oct-98	08-Oct-98	08-Oct-98	08-Oct-98	09-Oct-98	11-Oct-98	15-Oct-98
Sample Interval (ft bgs	23-28	31-34	32-35	27-30	22-29	84-87	95-99	110-120	50-54	Duplicate	DUP AVG	95-99	137-147	20-24
Acetone	12.5 U	32	12.5 U	25 U	12.5 U	5 U	5 U	5 U	5 U	5 U	5 U	46	5 U	66
LN	2.53	3.47	2.53	3.22	2.53	1.61	1.61	1.61			1.61	3.83	1.61	4.19
Chloroform	6 J	63	5 U	29	31	2.5 U	2.5 U	2.5 U	44	44	44	2.5 U	2.5 U	2.5 U
LN	1.79	4.14	1.61	3.37	3.43	0.92	0.92	0.92			3.78	0.92	0.92	0.92
Ethylbenzene	5 U	5 U	5 U	10 U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
LN	1.61	1.61	1.61	2.30	1.61	0.92	0.92	0.92			0.92	0.92	0.92	0.92
Methylene Chloride	5 U	5 U	5 U	10 U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
LN	1.61	1.61	1.61	2.30	1.61	0.92	0.92	0.92			0.92	0.92	0.92	0.92
Xylene(total)	10 U	10 U	13 J	5 J	10 U	5 U	5 U	5 U			5 U	5 U	5 U	5 U
LN	2.30	2.30	2.56	1.61	2.30	1.61	1.61	1.61			1.61	1.61	1.61	1.61
m&p-Xylene	10 U	10 U	7 J	5 J	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
LN	2.303	2.303	1.946	1.609	2.303	1.609	1.609	1.609			1.609	1.609	1.609	1.609
o-Xylene	5 U	5 U	6 J	10 U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
LN	1.609	1.609	1.792	2.303	1.609	0.916	0.916	0.916			0.916	0.916	0.916	0.916
Isophorone														
LN														
Arsenic														
LN														
Lead														
LN														
Manganese														

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ATTACHMENT A
Onsite Groundwater Data and 95% UCL Calculation for COPCs
Virgin Island Chemical Site

Sample ID	GWPP-36	GWPP-36	GWPP-36	GWPP-36	GWPP-36	GWPP-36	GWPP-36	GWPP-36	GWPP-36	GWPP-37	GWPP-37	GWPP-37	GWPP-37	GWPP-37
Sample Date	15-Oct-98	15-Oct-98	15-Oct-98	16-Oct-98	16-Oct-98	16-Oct-98	17-Oct-98	17-Oct-98	17-Oct-98	07-Oct-98	07-Oct-98	07-Oct-98	07-Oct-98	08-Oct-98
Sample Interval (ft bgs	50-54	75-79	82-85	82-85	Duplicate	DUP AVG	97-107	Duplicate	DUP AVG	35-39	45-49	70-74	80-84	97-107
Acetone	5 U	43	5 U	43	5 U	43	5 U	5 U	5 U	44	5 U	53	130	5 U
LN	1.61	3.76	1.61			3.76			1.61	3.78	1.61	3.97	4.87	1.61
Chloroform	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	1 J	2.5 U	2 J
LN	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.00	0.92	0.69
Ethylbenzene	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
LN	0.92	0.92	0.92			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Methylene Chloride	2.5 U	2.5 U	3 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
LN	0.92	0.92	1.10			0.92			0.92	0.92	0.92	0.92	0.92	0.92
Xylene(total)	5 U	5 U	5 U		2.5 U	2.5 U			5 U	2 J	5 U	5 U	5 U	5 U
LN	1.61	1.61	1.61			0.92			1.61	0.69	1.61	1.61	1.61	1.61
m&p-Xylene	5 U	5 U	5 U	5 U		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
LN	1.609	1.609	1.609			1.609			1.609	1.609	1.609	1.609	1.609	1.609
o-Xylene	2.5 U	2.5 U	2.5 U	2.5 U		2.5 U	2.5 U	2.5 U	2.5 U	2 J	2.5 U	2.5 U	1 J	2 J
LN	0.916	0.916	0.916			0.916			0.916	0.693	0.916	0.916	0	0.693
Isophorone														
LN														
Arsenic														
LN														
Lead														
LN														
Manganese														

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ATTACHMENT A
Onsite Groundwater Data and 95% UCL Calculation for COPCs
Virgin Island Chemical Site

Sample ID Sample Date Sample Interval (ft bgs	GWPP-37 15-Oct-98 124-134	GWPP-37 15-Oct-98 124-134	GWPP-37 15-Oct-98 DUP AVG	Normality	Mean	N	Maximum	Standard Deviation	H-Statistic[1]	95% UCL[1]
Acetone	5 U	5 U	5 U	Nonnormal (Positively Skewed, p < 0.0001)	230.87	73	7800.00	1133.00		
LN	1.61	1.61	1.61		2.48	73.00	8.96	1.98	3.40	185.96
Chloroform	2.5 U	2.5 U	2.5 U	Nonnormal (Positively Skewed, p < 0.0001)	228.68	79	3800.00	590.08		
LN	0.92	0.92	0.92		2.49	79.00	8.24	2.49	4.05	850.44
Ethylbenzene	2.5 U	2.5 U	2.5 U	Nonnormal (Positively Skewed, p < 0.0001)	947.90	84	22000.00	3953.53		
LN	0.92	0.92	0.92		1.52	84	10.00	2.46	3.98	279.75
Methylene Chloride	2 J	2.5 U	2 J	Nonnormal (Positively Skewed, p < 0.0001)	118.48	79	4300.00	614.16		
LN	0.69	0.92	0.69		1.41	79	8.37	1.81	3.16	39.95
Xylene(total)	10 U	2.5 U	10 U	Nonnormal (Positively Skewed, p < 0.0001)	4651.56	84	########	20212.28		
LN	2.30	0.92	2.30		2.10	84	11.61	2.66	4.24	960.13
m&p-Xylene	5 U		5 U	Nonnormal (Positively Skewed, p < 0.0001)	27.70	54	1000.00	135.54		
LN	1.61		1.61		2.04	54	6.91	0.88	2.19	14.78
o-Xylene	2.5 U		2.5 U	Nonnormal (Positively Skewed, p < 0.0001)	14.09	54	500.00	67.74		
LN	0.92		0.92		1.37	54	6.21	0.93	2.23	8.06
Isophorone				Nonnormal (Positively Skewed, p < 0.0001)	12.00	24	75.00	22.13		
LN				NA	1.44	24	4.32	1.20	2.80	17.62
Arsenic				Nonnormal (Positively Skewed, p < 0.0001)	1.15	24	5.20	1.09		
LN					-0.09	24.00	1.65	0.58	2.05	1.39
Lead				Nonnormal (Positively Skewed, p < 0.0001)	4.31	24	50.70	10.29		
LN					0.36	24.00	3.93	1.29	2.93	7.30
Manganese				Normal (p = 0.107)	1150.98	24	3570.00	1318.57		1614.19

Notes:

Concentrations presented in ug/L.

ft bgs - feet below ground surface

(1) Equations pertaining to the calculation of the 95% UCL can be found in USEPA 1992, *Supplemental Guidance to RAGS: Calculating the Concentration Term*.

LN - Natural Logarithm used to calculate the 95% UCL if the data were non-normal.

U - Material analyzed for but not detected. The number presented and used to calculate the 95% UCL is one-half the minimum quantitation limit.

J - Estimated value.

B (organics) - Analyte detected in associated laboratory blank.

B (inorganics) - Result is between instrument detection limit (IDL) and Contract Required Detection Limit (CRDL), these samples were not used in calculating the 95% UCL.

R - QC indicates that data is unusable. Analyte may or may not be present.

E - Exceeded calibration range of instrument.

D - Analyte quantitated on a diluted sample.

DUP AVG- The average of duplicate samples was used for calculating the 95% UCL.

Xylene - The higher the three (Total, m&p, and o-xylene was used for calculating the 95% UCL).

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ATTACHMENT A

95% UCL CALCULATIONS

ATTACHMENT A
Onsite Surface Soil Data and 95% UCL Calculations for COPCs
Virgin Island Chemical Site

Sample ID	SBC-2	SBD-4	SBC-1	SDCSD-2	SDCSD-3	SDSSD-1	SDSSD-2	SBD-1	SBF-1	SBF-2
Sample Date	31-Jan-95	27-Jan-95	27-Jan-95	07-Oct-97	07-Oct-97	07-Oct-97	07-Oct-97	25-Jan-95	03-Feb-95	03-Feb-95
Sample Interval (ft bgs)	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
Arsenic	0.75 U	1.1 NR	0.27 NR	8.8	3.7	0.81 B	0.87 B	0.6 U	0.96 BJ	0.95 BJW
LN	-0.29			2.17	1.31	-0.21	-0.14	-0.51	-0.04	-0.05
Iron	26300 *	37300 *J	31400 *J	58800	19700	19100	18800	25400 *	18100	23500
LN	10.18	10.53	10.35	10.98	9.89	9.86	9.84	10.14	9.80	10.06
Manganese	689	1040	812	595 J	311 J	503 J	494 J	976	489	601
LN	6.54	6.95	6.70	6.39	5.74	6.22	6.20	6.88	6.19	6.40
Chromium	18.9 J	28.1 J	22.6 J	32	22.7	13.9	14.6	19.8	14.8 J	21.4 J
LN	2.94	3.34	3.12	3.47	3.12	2.63	2.68	2.99	2.69	3.06
Vanadium	65.6	155 NJ	112 NJ	34.3	39.5	52.1	50.1	99.4	48.7	89.1
LN	4.18	5.04	4.72	3.54	3.68	3.95	3.91	4.60	3.89	4.49
Zinc	182	59 EJ	5790 EJ	336	346	40.5 R	74.4	89.5	87.9 EJ	178 EJ
LN	5.20	4.08	8.66	5.82	5.85	3.70	4.31	4.49	4.48	5.18

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ATTACHMENT A
Onsite Surface Soil Data and 95% UCL Calculations for COPCs
Virgin Island Chemical Site

Sample ID	SBF-3	SBB-1	SBB-1	SBB-1							
Sample Date	24-Jan-95	31-Jan-95	31-Jan-95	31-Jan-95		Arithmetic			Standard		
Sample Interval (ft bgs)	0-1	0-1	Duplicate	DUP AVG	Normality	Mean	Maximum	N	Deviation	H-Statistic[1]	95% UCL[1]
Arsenic	0.25 NR	0.27 NR	1.5 NR	Rejected	Nonnormal (Positively Skewed, p < 0.0001)	2.18	8.80	8	2.86		
LN						0.28	2.17	8	0.94	3.36	6.83
Iron	63400 *J	32100 *J	37000 *J	34550 *J	Nonnormal (Positively Skewed, p = 0.015)	31,362.50	63,400.00	12	15,278.40		
LN	11.06			10.45		10.26	11.06	12	0.43	2.06	40,920.87
Manganese	888	1860	2100	1980	Nonnormal (Positively Skewed, p = 0.001)	781.50	1,980.00	12	436.56		
LN	6.79	7.53	7.65	7.59		6.55	7.59	12	0.48	2.11	1,059.77
Chromium	30.4 J	19.9 J	21.9 J	20.9 J	0	0.00	0.00	0	0.00		
LN	3.41	2.99	3.09	3.04		21.68	32.00	12	6.00	0.00	0.00
Vanadium	99.2 NJ	109 NJ	110 NJ	109.5 NJ	0	3.04	3.47	12	0.28		
LN	4.60	4.69	4.70	4.70		79.54	155.00	12	36.84	0.00	0.00
Zinc	479 EJ	72.7 EJ	3620 EJ	1846.4	0	4.27	5.04	12	0.48		
LN	6.17	4.29	8.19	7.52		792.39	5,790.00	12	1,650.12	0.00	0.00

Notes:

Concentrations presented in mg/kg.

ft bgs - feet below ground surface

(1) Equations pertaining to the calculation of the 95% UCL can be found in USEPA 1992 *Supplemental Guidance to RAGS: Calculating the Concentration T*

U - Material analyzed for but not detected. The number presented and used to calculate the 95% UCL is one-half the minimum quantitation limit.

J - Estimated value.

R - QC indicates that data is unusable. Analyte may or may not be present. Was not used to calculate the 95% UCL.

B - Result is between instrument detection limit (IDL) and Contract Required Detection Limit (CRDL).

* - Duplicate analysis not within control limits.

N - Spike recovery not within control limits.

LN - Natural Logarithm used to calculate the 95% UCL if the data were non-normal.

303940

ATTACHMENT A
Sediment Data and 95% UCL Calculations for COPCs in the Gut System
Virgin Island Chemical Site

Sample ID	RG-2	RG-2 (dup)	RG-2 (dup avg)	RG-3	RG-4	RG-4 (dup)	RG-4 (dup avg)	RG-5	RG-6	RG-7	RG-8	RG-9
Sample Date	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97	23-Sep-97
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Arsenic	1.6 BJ	0.17 U	1.6 BJ	0.86 BJ	1.2 BJ	0.17 U	1.2 BJ	0.91 BJ	0.36 BJ	0.92 BJ	0.155 U	1.1 BJ
LN			0.47	-0.15			0.18	-0.09	-1.02	-0.08	-1.86	0.10
Iron	26800	30900	28850	27300	22700	14500	18600	22300	19800	21100	15800	27500

303941

ATTACHMENT A
Sediment Data and 95% UCL Calculations for COPCs in the Gut System
Virgin Island Chemical Site

Sample ID	RG-10	RG-11	RG-12	RG-13	RG-14	RG-15	RG-16	BG-1	BG-2	FPG-1	FPG-2	FPG-3	MB-1
Sample Date	23-Sep-97	23-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97	16-Sep-97
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Sediment	Sediment
Arsenic	1 BJ	0.38 BJ	0.48 BJ	1.1 BJ	1.5 BJ	0.15 U	0.17 U	0.195 U	0.43 BJ	1.4 BJ	2.8 J	1.3 BJ	1.7 B
LN	0.00	-0.97	-0.73	0.10	0.41	-1.90	-1.77	-1.63	-0.84	0.34	1.03	0.26	0.53
Iron	16000	12700	12500	23100	9160 J	4330	5780	20400	5300	14300	14800	15200	4320

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ATTACHMENT A
Sediment Data and 95% UCL Calculations for COPCs in the Gut System
Virgin Island Chemical Site

Sample ID Sample Date Sample Matrix	Normality	Mean	N	Maximum	Standard Deviation	H-Statistic[1]	95% UCL[1]
Arsenic	Nonnormal (Positively Skewed, p = 0.041)	0.94	21.00	2.80	0.66		
LN		-0.36	21.00		0.88	2.40	1.63
Iron	Normal (p = 0.905)	16,149.52	21.00	28,850.00	7,575.45		18,994.51

Concentrations presented in mg/kg.

(1) Equations pertaining to the calculation of the 95% UCL can be found in USEPA 1992, *Supplemental Guidance to RAGS: Calculating the Concentration Term*.

(dup) - duplicate sample.

(dup avg) - the average result of the two duplicate samples was used in the calculation of the 95% UCL.

U - Material analyzed for but not detected. The number presented and used to calculate the 95% UCL is one-half the minimum quantitation limit.

J = Estimated value.

B = Result is between the instrument detection limit (IDL) and Contract Required Detection Limit (CRDL).

LN= Natural Logarithm used to calculate the 95% UCL if the data were non-normal.

303943

ATTACHMENT B

CALCULATIONS OF VAPOR PHASE VOC CONCENTRATIONS

ATTACHMENT B
CALCULATION OF VAPOR PHASE VOC CONCENTRATIONS

The evaluation of the risks to a hypothetical future resident from exposure to groundwater is a pathway in the risk assessment of the VICHEM Site. In order to evaluate potential inhalation risks from groundwater use, USEPA and its oversight contractor (CDM) requested that a shower model be used to derive vapor phase concentrations for volatile organic compounds (VOCs) that are COPCs for the Site. The risk assessment evaluates inhalation exposure due to showering (adult resident) or bathing (child resident). The equations used to derive the vapor phase concentrations are as follows (Andelman, 1990; Schaum *et al.*, 1994):

$$C_{(aMAX)} = C_{(w)} * f * F_{(w)} * t1 / V_{(a)} \quad (1)$$

$$C_{(a)} = [(C_{(aMAX)}/2) * t1 + C_{(aMAX)} * t2] / (t1+t2) \quad (2)$$

Where:
$C_{(a)}$ = concentration of volatile chemical contaminant is air (mg/m^3);
$C_{(aMAX)}$ = maximum air concentration in bathroom (mg/m^3);
$C_{(w)}$ = water concentration (mg/l);
f = fraction volatilized (unitless);
$F_{(w)}$ = water flow rate (l/hr);
$V_{(a)}$ = bathroom volume, including the shower stall (m^3);
t1 = time spent in shower/bath (hr); and,
t2 = time spent in bathroom following shower/bath (hr).

This shower model was used to provide a conservative estimate of vapor phase concentrations in both shower and bathing exposure scenario. Values used for each of the above parameters were suggested by USEPA and/or CDM and are summarized in Table B-1 together with the calculated vapor phase concentrations. As noted by Schaum, et al. (1994) "the assumptions of constant volatization and no ventilation tend to make this model very conservative, that is, it is likely to overestimate actual levels." Additional assumptions made by this model include the following:

- The concentration of the chemical contaminant is assumed to be zero at the start of the shower;
- The exchange between air in the shower stall and bathroom air is so rapid that the combined volume of the two compartments can be treated as a single chamber with a single concentration of volatilized chemical; and,
- The model does not account for the exchange rate that occurs when an exhaust fan is turned on.

TABLE B-1
VICHEM Shower Model Calculations

Parameter	C(w) [mg/L]	*f* (unitless)	F(w) (l/hr)	t1 (hours)	C(aMAX) [mg/m^3]	t2 (hours)	C(a) [mg/m^3]
Acetone	1.9E-01	0.5	600	0.2	9.4E-01	0.33	7.59E-01
Chloroform	8.7E-01	0.5	600	0.2	4.3E+00	0.33	3.51E+00
Dimethylphenol, 2,4-	1.7E-02	0.5	600	0.2	8.6E-02	0.33	6.98E-02
Ethylbenzene	2.8E-01	0.5	600	0.2	1.4E+00	0.33	1.14E+00
Isophorone	1.8E-02	0.5	600	0.2	8.8E-02	0.33	7.14E-02
Methylene chloride	4.0E-02	0.5	600	0.2	2.0E-01	0.33	1.62E-01
Methylphenol, 2-	2.4E-02	0.5	600	0.2	1.2E-01	0.33	9.78E-02
Toluene	3.1E-02	0.5	600	0.2	1.5E-01	0.33	1.25E-01
Xylene	9.6E-01	0.5	600	0.2	4.8E+00	0.33	3.89E+00

1. Equations used to calculate C(aMAX) and C(a) are as follows:

$C(aMAX) = (C(w)*f*F(w)*t1/V(a)$
$C(a) = [(C(aMAX)/2)*t1 + C(aMAX)*t2]/(t1+t2)$

terms are defined as follows:

C(a) = concentration of chemical contaminant in air (mg/m^3)
C(aMAX) = maximum air concentration in bathroom (mg/m^3)
C(w) = water concentration (mg/l)
f = fraction volatilized (unitless)
F(w) = water flow rate (l/hr)
V(a) = bathroom volume, including the stall (m^3)
C(aMAX) = maximum concentration of chemical contaminant in air (mg/m^3)
t1 = time of shower (hr)
t2 = time after shower (hr)

2. Parameter Inputs: C(w) based upon 95% UCL for groundwater
f = 0.5 (Andelman,1990)
F(w) = 600 l/hr (USEPA Comments dated August 22, 2000)
t1 = 0.2 hr (USEPA Comments dated August 22, 2000)
t2 = 0.33 hr (USEPA Comments dated August 22, 2000)
V(a) = 12 m^3 (CDM)

3. References:

Andelman, J., 1990. "Total Exposure to Volatile Organic Compounds in Potable Water", Chapter 20. Significance and Treatment of Volatile Organic Coumpounds in Water Supplies. Editors, Cantor, K., Christman, N. Lewis, Publisher, Michigan. Pages 485-504.

Schaum, J. Hoang, K., Kinerson, R., Moya, J., and Wang, R. 1994. "Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water". Water Contamination and Health-Integration of Exposure Assessment, Toxicology, and Risk Assessment. R. Wang, Human Risk Assessment Branch, USEPA, Editor Marcel Dekker, Inc., New York, Basel, Hong Kong.

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TABLES

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TABLE 1
SELECTION OF EXPOSURE PATHWAYS
Virgin Island Chemical Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Groundwater	Groundwater	Off-site production wells	Resident	Adult	Ingestion Dermal	Off-Site	None	No COPCs were identified in this medium.
					Child	Ingestion Dermal	Off-Site	None	No COPCs were identified in this medium.
		Air	Water Vapors at Showerhead	Resident	Adult	Inhalation	Off-site	None	No COPCs were identified in this medium.
					Child	Inhalation	Off-site	None	No COPCs were identified in this medium.
	Surface Soil	Surface Soil	VICHEM Site	Trespasser	Adult	Ingestion Dermal	On-site	Quant	Site access is not restricted.
					Pre-adolescent	Ingestion Dermal	On-site	Quant	Site access is not restricted.
		Air	VICHEM Site	Trespasser	Adult	Inhalation	On-site	Quant	Site access is not restricted.
					Pre-adolescent	Inhalation	On-site	Quant	Site access is not restricted.
	Soil/Sediment	Soil/Sediment	Gut System Adjacent to the Site	Trespasser	Adult	Ingestion Dermal	On-site	Quant	Access to the gut system is not restricted and this area remains dry most of the time.
					Pre-adolescent	Ingestion Dermal	On-site	Quant	Access to the gut system is not restricted and this area remains dry most of the time.
		Air	Gut System Adjacent to the Site	Trespasser	Adult	Inhalation	On-site	Quant	Access to the gut system is not restricted and this area remains dry most of the time.
					Pre-adolescent	Inhalation	On-site	Quant	Access to the gut system is not restricted and this area remains dry most of the time.
Future	Groundwater	Groundwater	Tap water	Resident	Adult	Ingestion Dermal	On-site	Quant	Hypothetical future use scenario.
					Child	Ingestion Dermal	On-site	Quant	Hypothetical future use scenario.
		Air	Water Vapors from Bathing	Resident	Adult	Inhalation	On-site	Quant	Hypothetical future use showering scenario.
					Child	Inhalation	On-site	None	Hypothetical future use bathing scenario.
	Groundwater	Groundwater	Local Aquifers: Aluvium (shallow) and Kingshill (deep)	Industrial/Commercial Worker	Adult	Ingestion Dermal	On-site	Quant	Hypothetical future use scenario.
		Air	Local Aquifers: Aluvium (shallow) and Kingshill (deep)	Industrial/Commercial Worker	Adult	Inhalation	On-site	Quant	Hypothetical future use scenario.
	Surface Soil	Surface Soil	VICHEM Site	Industrial/Commercial Worker	Adult	Ingestion Dermal	On-site	Quant	Hypothetical future use scenario.
		Air	VICHEM Site	Industrial/Commercial Worker	Adult	Inhalation	On-site	Quant	Hypothetical future use scenario.
	Soil/Sediment	Soil/Sediment	Gut System Adjacent to the Site	Industrial/Commercial Worker	Adult	Ingestion Dermal	On-site	Quant	Hypothetical future use scenario.
		Air	Gut System Adjacent to the Site	Industrial/Commercial Worker	Adult	Inhalation	On-site	Quant	Hypothetical future use scenario.
	Surface Soil	Surface Soil	VICHEM Site	Construction Worker	Adult	Ingestion Dermal	On-site	Quant	Hypothetical future use scenario.
		Air	VICHEM Site	Construction Worker	Adult	Inhalation	On-site	Quant	Hypothetical future use scenario.
	Subsurface Soil	Subsurface Soil	VICHEM Site	Construction Worker	Adult	Ingestion Dermal	On-site	None	No COPCs were identified in this medium.
		Air	VICHEM Site	Construction Worker	Adult	Inhalation	On-site	None	No COPCs were identified in this medium.
	Soil/Sediment	Soil/Sediment	Gut System Adjacent to the Site	Construction Worker	Adult	Ingestion Dermal	On-site	Quant	Hypothetical future use scenario.
		Air	Gut System Adjacent to the Site	Construction Worker	Adult	Inhalation	On-site	Quant	Hypothetical future use scenario.

VICHEM - Virgin Island Chemical Site

303948

Table 2.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Groundwater
Exposure Medium: Groundwater/Air
Exposure Point: Off-site production wells/
Water vapors at showerhead

CAS #	Chemical	Minimum Concentration (µg/L)	Minimum Qualifier	Maximum Concentration (µg/L)	Maximum Qualifier	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (µg/L)	Potential ARAR/TBC (µg/L)	Potential ARAR/TBC Source	COPC	Rationale for Contaminant Deletion or Selection
67-64-1	Acetone	15.4		15.4		Fairplains #9	1/7	10	15.4	NE	61	RBC	No	BSL
108-38-3, 106-42-3	m,p-Xylenes	1	J	1	J	VIPA#2	1/7	5 - 10	1	NE	1,200	RBC	No	BSL

Notes:
J - Estimated value.
RBC - Risk-Based Concentration (USEPA Region 3, April 1999), HQ = 0.1
COPC - Chemical of potential concern
ARAR/TBC - Applicable or relevant and appropriate requirement/To be considered
BSL - Below screening levels
NE - none established

The most recent data from Charlies #1, #2, VIPA #1, #2, Fairplains #9, and Carino's wells was used for the COPC screening. Although historical data from VIPA #1 and #2 data indicate the detection of some metals, the quantitative results for these data were not available in many cases and in instances where this data was available, concentrations were less than the ARAR/TBC values used for groundwater screening. A historical detection (June 1990) of chloroform (2Jppb) in VIPA #1 was dismissed in the evaluation of the offsite wells since more recent data for this well was available and indicated no detections for this chemical.

303949

Table 2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil/ Air
Exposure Point: VICHEM Site

CAS #	Chemical	Minimum Concentration	Minimum Qualifier	Maximum Concentration	Maximum Qualifier	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration used for screening	Background Value	Potential ARAR/TBC value		Potential ARAR/TBC Source	COPC	Rationale for Contaminant Deletion or Selection (4)
											Ingestion	Inhalation			
	Organic Compounds (ug/kg)														
75-15-0	Carbon Disulfide	1	J	3	J	SBC-2	3/6	12	3	NE	780,000	720,000	RBC/SSL	no	BSL
75-35-4	1,1-Dichloroethene	1	J	1	J	SBC-2	1/6	11 - 12	1	NE	1,100	70	RBC/SSL	no	BSL
100-41-4	Ethylbenzene	4	J	4	J	SBB-1	1/6	11 - 12	4	NE	780,000	400,000	RBC/SSL	no	BSL
108-88-3	Toluene	10	J	12	J	SBD-4	2/6	12	12	NE	1,600,000	650,000	RBC/SSL	no	BSL
1330-20-7	Xylenes	1	J	25		SBB-1	4/6	11	25	NE	16,000,000	410,000	RBC/SSL	no	BSL
117-81-7	Bis(2-ethylhexyl)phthlate	75	J	7800	DJ	SDCSD-2	5/10	370 - 1800	7800	NE	46,000	31,000,000	RBC/SSL	no	BSL
85-68-7	Butylbenzyl phthalate	120	J	490	J	SBF-3	1/10	360 - 2100	490	NE	1,600,000	930,000	RBC/SSL	no	BSL
84-74-2	Di-n-butylphthalate	32	J	57	J	SBC-2	2/10	360 - 510	57	NE	780,000	2,300,000	RBC/SSL	no	BSL
78-59-1	Isophorone	320	J	2500		SDSSD-2	2/10	360 - 510	2500	NE	670,000	4,600,000	RBC/SSL	no	BSL
87-86-5	Pentachlorophenol	1900	J	1900	J	SBF-3	1/10	880 - 1200	1900	NE	5,300	NE	RBC/SSL	no	BSL
	Inorganic Compounds (mg/kg)														
7429-90-5	Aluminum	8390		25750	*J	SBB-1	12/12		25,750	21,760	7,800	NE	RBC	no	BKG
7440-36-0	Antimony	0.39	BJN	1.3	WJ	SBC-2	4/9	0.31 - 0.62	1.3	ND	3.1	NE	RBC	no	BSL
7440-38-2	**Arsenic**	**0.81**	**B**	**8.8**		**SDCSD-2**	**6/8**	**1.2 - 1.5**	**8.8**	**1.64**	**0.43**	**750**	RBC	**yes**	**ASL**
7440-39-3	Barium	44	B	274		SBD-4	12/12		274	135	550	690,000	RBC	no	BSL
7440-41-7	Beryllium	0.21	B	0.45		SBB-1	6/12	0.02 - 0.21	0.45	ND	16	1,300	RBC	no	BSL
7440-43-9	Cadmium	0.52	B	6.4	N*J	SBF-3	12/12		6.4	0.66	7.8 (a)	1,800	SSL	no	BSL
7440-70-2	Calcium	15000		119000	*	SBF-1	12/12		119,000	131,267	NE	NE		no	NUT, BKG
7440-47-3	**Chromium**	**14.8**	***J**	**32**		**SDCSD-2**	**12/12**		**32**	**23.6**	**23(b)**	**270 (b)**	**RBC**	**yes**	**ASL**
7440-48-4	Cobalt	7.5	BJ	30.7		SBB-1	12/12		30.7	18.3	470	NE	RBC	no	BSL
7440-50-8	Copper	28.7		280	J	SDCSD-2	12/12		280	61.5	310	NE	RBC	no	BSL
743-98-96	**Iron**	**18100**		**63400**	***J**	**SBF-3**	**12/12**		**63,400**	**31,933**	**2,300**	**NE**	**RBC**	**yes**	**ASL**
7439-92-1	Lead	3	NS*J	35.2		SDCSD-2	11/12	0.23	35.2	19.63	400	NE	SSL	no	BSL
7439-95-4	Magnesium	4090		13900		SBD-4	12/12		13900	10820	NE	NE		no	NUT, BKG
7439-96-5	**Manganese**	**311**	**J**	**1980**		**SBB-1**	**12/12**		**1980**	**959**	**160 (c)**	**NE**	**RBC**	**yes**	**ASL**
7439-97-6	Mercury	0.15		0.33		SBD-4	7/12	0.11 - 0.15	0.33	0.3	23	10	SSL	no	BSL
7440-02-0	Nickel	8.3	B	26.9	*J	SBF-3	12/12		26.9	14.73	160	13,000	RBC	no	BSL
7440-09-7	Potassium	838	B	4255		SBB-1	12/12		4,255	5,163	NE	NE		no	NUT, BKG
7782-49-2	Selenium	0.94	BJ	0.94	BJ	SDCSD-2	1/4	0.57 - 0.69	0.94	1.01	39	NE	RBC	no	BSL, BKG
7440-22-4	Silver	0.92	B	1.5	B	SDCSD-2	4/12	1.1 - 1.4	1.5	ND	39	NE	RBC	no	BSL
7440-23-5	Sodium	385	B	2430		SBC-1	12/12		2430	644	NE	NE		no	NTX, NUT
7440-62-2	**Vanadium**	**34.3**		**155**	**NJ**	**SBD-4**	**12/12**		**155**	**89.27**	**55**	**NE**	**RBC**	**yes**	**ASL**
7440-66-6	**Zinc**	**59**	**E*J**	**5790**	**E*J**	**SBC-1**	**11/11**		**5790**	**R**	**2,300**	**NE**	**RBC**	**yes**	**ASL**

Notes:

Data used from 0-1 foot interval

Bold print denotes Chemical of Potential Concern (COPC).

ARAR/TBC - Applicable or relevant and appropriate requirement/To be considered

(a) - based on cadmium as food

(b) - based on hexavalent chromium (Cr^{6+})

(c) - based on manganese as a nonfood

Maximum concentrations of inorganics from SBB-1 represent the average of duplicate results.

B - Result is between instrument detection limit (IDL) and Contract Required Detection Limit (CRDL).

D - duplicate analysis

R - Background data for zinc was determined to be unusable; no site-specific background is available.

J - Estimated value.

S - determined by method of standard additions

N - Spike recovery not within control limits.

* - Duplicate analysis not within control limits.

E - Estimated due to the presence of interference.

W - GFAA post-digest spike out of control limits.

NE - None Established

SSL - USEPA Soil Screening Level (USEPA, 1996)

RBC - Risk-Based Concentration residential (EPA Region 3, Oct. 1999), based on HQ = 0.1

BSL - Below screening levels

ASL - Above screening levels

NUT - Essential nutrient

NTX - No toxicity information

IFD - Infrequent detection.

BKG - Background levels

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Table 2.3
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment, Air
Exposure Point: Gut System

CAS #	Chemical	Minimum Concentration (mg/kg)	Minimum Qualifier	Maximum Concentration (mg/kg)	Maximum Qualifier	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration used for screening	Background Value (mg/kg)	Potential ARAR/TBC value		Potential ARAR/TBC Source	COPC	Rationale for Contaminant Deletion of Selection
											Ingestion (mg/kg)	Inhalation (mg/kg)			
7429-90-5	**Aluminum**	**2770**		**16600**		**RG-2**	**21/21**		**16,600**	**NE**	**7,800**	**NE**	**RBC**	**yes**	**ASL**
7440-38-2	**Arsenic**	**0.36**	**BJ**	**2.8**	**J**	**FPG-2**	**15/21**	**0.3 - 0.39**	**2.8**	**NE**	**0.43**	**NE**	**RBC**	**yes**	**ASL**
7440-39-3	Barium	8.7	B	112		RG-13	21/21		112	NE	550	690,000	RBC/SSL	no	BSL
7440-43-9	Cadmium	0.03	B	0.86	B	RG-13	17/21	0.02 - 0.04	0.86	NE	7.8(a)	1,800	RBC/SSL	no	BSL
7440-70-2	Calcium	17900		800000		RG-15	21/21		800,000	NE	NE	NE		no	NUT, NTX
7440-47-3	**Chromium**	**3**		**39**	**J**	**RG-14**	**21/21**		**39**	**NE**	**23 (b)**	**270**	**RBC/SSL**	**yes**	**ASL**
7440-48-4	Cobalt	2.2	BJ	15.8	J	RG-2	21/21		15.8	NE	470	NE	RBC	no	BSL
7440-50-8	Copper	6	B	49.3	J	RG-2	21/21		49.3	NE	310	NE	RBC	no	BSL
7439-89-6	**Iron**	**4320**		**28850**		**RG-2**	**21/21**		**28850**	**NE**	2,300	**NE**	**RBC**	**yes**	**ASL**
7439-92-1	Lead	1.6	J	26.1	J	RG-5	21/21		26.1	NE	400	NE	SSL	no	BSL
7439-95-4	Magnesium	1150		8600		RG-3	21/21		8600	NE	NE	NE		no	NUT, NTX
7439-96-5	**Manganese**	**64.6**	**J**	**792**	**J**	**RG-3**	**21/21**		**792**	**NE**	**160 (c)**	**NE**	**RBC**	**yes**	**ASL**
7439-97-6	Mercury	0.11	J	0.39	J	RG-11	8/21	0.1 - 0.18	0.39	NE	23	10	SSL	no	BSL
7440-02-0	Nickel	1.3	B	17	J	RG-9	21/21		17	NE	160	13,000	SSL	no	BSL
7440-09-7	Potassium	493	B	3540	J	RG-9	21/21		3540	NE	NE	NE		no	NUT, NTX
7782-49-2	Selenium	0.68	B	1.6		RG-13	7/21	0.53 - 0.76	1.6	NE	39	NE	RBC	no	BSL
7440-23-5	Sodium	215	BJ	21100	B	FPG-3	21/21		21100	NE	NE	NE		no	NUT, NTX
7440-62-2	**Vanadium**	**15**		**85.9**		**RG-9**	**21/21**		**85.9**	**NE**	**55**	**NE**	**RBC**	**yes**	**ASL**
7440-66-6	Zinc	12.2	J	201.5	J	RG-2	21/21		201.5	NE	2,300	NE	RBC	no	BSL

Notes:

1997 soil/sediment data used for screening
Maximum concentrations from RG-2 represent the average of duplicate results.
COPC - Chemical of potential concern
ARAR/TBC - Applicable or relevant and appropriate requirement/To be considered
J = Estimated value.
B = Result is between the instrument detection limit (IDL) and Contract Required Detection Limit (CRDL).
(a) - based on cadmium as food
(b) - based on hexavalent chromium
(c) - based on nonfood ingestion of manganese

NE - None Established
SSL - USEPA Soil Screening Level (USEPA, 1996)
RBC - Risk-Based Concentration (USEPA Region 3, October 1999), based on HQ = 0.1
BSL - Below screening levels
ASL - Above screening levels
NUT - Essential nutrient
NTX - No toxicity information

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Table 2.4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater/Air
Exposure Point: Local Aquifers (Alluvium & Kingshill)

CAS #	Chemical	Minimum Concentration (µg/L)	Minimum Qualifier	Maximum Concentration (µg/L)	Maximum Qualifier	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration used for screening (µg/L)	Background Value (µg/L)	Potential ARAR/TBC value (µg/L)	Potential ARAR/TBC Source	COPC	Rationale for Contaminant Deletion of Selection
	Organic Compounds													
67-64-1	Acetone	2	BJ	7800	BJ	MW-1	20/73	0.1 - 2500	7800	NE	61	RBC	Yes	ASL
71-43-2	Benzene	0.1	J	0.1	J	MW-3	2/28	1 - 2,000	0.1	NE	0.36	RBC	No	BSL
78-93-3	2-Butanone	0.8	J	0.8	J	MW-9	1/28	1 - 10,000	0.8	NE	190	RBC	No	BSL, IFD
67-66-3	Chloroform	2	J	3880		GWPP-27	39/79	1 - 2,000	3880	NE	0.15	RBC	Yes	ASL
100-41-4	Ethylbenzene	0.3	J	22000		MW-6	16/84	0.5 - 1000	22000	NE	130	RBC	Yes	ASL
75-09-2	Methylene Chloride	2	J	4300	BJ	MW-1	5/79	0.6 - 1000	4300	NE	4.1	RBC	Yes	ASL
108-88-3	Toluene	0.1	J	590		MW-6	23/84	0.1 - 1000	590	NE	75	RBC	Yes	ASL
79-01-6	Trichloroethene	0.1	J	0.1	J	MW-3	1/28	1 - 2000	0.1	NE	1.6	RBC	No	BSL, IFD
75-01-4	Vinyl Chloride	0.2	J	0.2	J	MW-10	1/28	1 - 2000	0.2	NE	0.019	RBC	No	IFD
1330-20-7	Xylenes (total)	0.4	J	110000		MW-6	25/84	1 - 2000	110000	NE	1,200	RBC	Yes	ASL
106-47-8	4-Chloroaniline	11	J	11	J	MW-3	1/15	5 - 100	11	NE	15	RBC	No	BSL
105-67-9	2,4-Dimethylphenol	28	J	110	J	MW-6	4/24	5	110	NE	73	RBC	Yes	ASL
78-59-1	Isophorone	47	J	75		MW-1	4/24	5	75	NE	70	RBC	Yes	ASL
95-48-7	2-Methylphenol	32	J	200	J	MW-1	3/24	5 - 100	200	NE	180	RBC	Yes	ASL
	Inorganic Compounds													
7429-90-5	Aluminum	19.5	BJ	1420	EJ	MW-10	21/21		1420	NE	3,700	RBC	No	BSL
7440-36-0	Antimony	2.2	B	6.2	B	MW-6	9/24	2.2	6.2	NE	1.5	RBC	Yes	ASL
7440-38-2	Arsenic	2	B	5.2	B	MW-10	5/24	1.4	5.2	NE	0.045	RBC	Yes	ASL
7440-39-3	Barium	39.8	B	508		MW-6	24/24		508	NE	260	RBC	Yes	BSL
7440-41-7	Beryllium	0.19	B	0.19	B	MW-5	1/24	0.1 - 1	0.19	NE	7.3	RBC	No	BSL, IFD
7440-43-9	Cadmium	0.23	B	0.58	B	MW-3	7/24	0.1 - 1	0.58	NE	1.8(a)	RBC	No	BSL
7440-70-2	Calcium	31800	J	105,000		MW-3	24/24		105000	NE	NE	NE	No	NUT, NTX
7440-47-3	Chromium	0.7	B	25.7		MW-10	24/24		25.7	NE	11 (b)	RBC	Yes	ASL
7440-48-4	Cobalt	0.35	B	7	B	MW-10	17/24	0.3	7	NE	220	RBC	No	BSL
7440-50-8	Copper	2.8	B	33		MW-6	24/24		33	NE	150	RBC	No	BSL
7439-98-96	Iron	31	BJ	10100		P-2	18/24	7 - 1710	10100	NE	1,100	RBC	Yes	ASL
7439-92-1	Lead	2	B	50.7		MW-10	5/24	1.1 - 13.1	50.7	NE	15	TTAL	Yes	ASL
7439-95-4	Magnesium	22,400	J	68,900		MW-2	24/24		68,900	NE	NE	NE	No	NUT, NTX
7439-96-5	Manganese	10.2	BJ	3,570		MW-3	23/23		3570	NE	510 (c)	RBC	Yes	ASL
7439-97-6	Mercury	0.21		0.51		MW-7	7/21	0.2	0.51	NE	50	MCL	No	BSL
7440-02-0	Nickel	1	B	16.3	B	MW-10	9/24	1	16.3	NE	73	RBC	No	BSL
7440-09-7	Potassium	1540	B	42,800	EJ	MW-3	24/24		42,800	NE	NE	NE	No	NUT, NTX
7782-49-2	Selenium	2	BJ	3.9	BJ	MW-3	7/24	2	3.9	NE	18	RBC	No	BSL
7440-22-4	Silver	0.94	B	2.2	B	MW-3	7/24	0.7	2.2	NE	18	RBC	No	BSL
7440-23-5	Sodium	212,000		723,000		MW-2	24/24		723,000	NE	NE	NE	No	NUT, NTX
7440-28-0	Thallium	0.86	B	0.86	B	MW-6	1/24	0.8 - 1.6	0.86	NE	0.26	RBC	No	IFD
7440-62-2	Vanadium	0.49	B	58.6		P-2	24/24		58.6	NE	26	RBC	Yes	ASL
7440-66-6	Zinc	27	J	186.5	E*J	MW-6	11/15	21.2 - 169	187	NE	1,100	RBC	No	BSL

Notes:

All 1998 data used for screening (1/98-10/98, Monitoring Well and Geoprobe)
ARAR/TBC - Applicable or relevant and appropriate requirement/To be considered
J - Estimated value.
B - (Organics) Analyte detected in associated laboratory blank.
B - (Inorganics) Result is between instrument detection limit (IDL) and Contract Required Detection Limit (CRDL).
(a) - based on cadmium in water
(b) - based on hexavalent chromium
(c) - based on manganese as food

* - Duplicate analysis not within control limits.
E - Estimated due to the presence of interference.
NE - None established
TTAL - Treatment Technique Action Level
RBC - Risk-Based Concentration (USEPA Region 3, October 1999) based on HQ = 0.1

MCL - Maximum Contaminant Level

COPC - Chemical of potential concern
BSL - Below screening levels
ASL - Above screening levels
NUT - Essential nutrient
NTX - No toxicity information
IFD - Infrequent detection.

303952

Table 2.5
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil, Air
Exposure Point: VICHEM Site

CAS #	Chemical	Minimum Concentration	Minimum Qualifier	Maximum Concentration	Maximum Qualifier	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg)	Potential ARAR/TBC value	Potential ARAR/TBC Source	COPC	Rationale for Contaminant Deletion of Selection
	Organic Compounds (in ug/kg)													
67-64-1	Acetone	20	J	19,000	J	SBB-1	7/53	10 - 73,000	19,000	NE	20,000,000	RBC	No	BSL
75-15-0	Carbon Disulfide	2	J	2	J	SBD-2	1/21	10 - 73,000	2	NE	20,000,000	RBC	No	BSL, IFD
67-66-3	Chloroform	11	J	130	J	SBPP-2	2/54	10 - 73,000	130	NE	940,000	RBC	No	BSL
100-41-4	Ethylbenzene	5	J	150,000		SBB-4	8/54	10 - 150000	150,000	NE	20,000,000	RBC	No	BSL
75-09-2	Methylene Chloride	7	BJ	12,000	BJ	SBB-4	3/54	6 - 12000	12,000	NE	760,000	RBC	No	BSL
127-18-4	Tetrachloroethene	2	J	2	J	SB64D-2, SB238D-1, SB238D-2, SB238D-3	4/21	11 - 73000	2	NE	110,000	RBC	No	BSL
108-88-3	Toluene	4	J	1,000	J	SBB-1	7/54	5 - 73000	1,000	NE	41,000,000	RBC	No	BSL
79-01-6	Trichloroethene	1	J	17		SBAST-2	2/21	10 - 73000	17	NE	520,000	RBC	No	BSL
1330-20-7	Xylenes (total)	1	J	310,000		SBB-1	16/54	10 - 310000	310,000	NE	410,000,000	RBC	No	BSL
117-81-7	Bis(2-ethylhexyl)phthalate	81	J	81	J	SB64D-1	2/13	340 - 680	81	NE	410,000	RBC	No	BSL
117-84-0	Di-n-octylphthalate	50	J	120	J	SBD-3	2/13	340 - 680	120	NE	4,100,000	RBC	No	BSL
86-73-7	Fluorene	230	J	230	J	SBAST-2	1/13	340 - 680	230	NE	8,200,000	RBC	No	BSL
91-57-6	2-Methylnapthalene	380	J	380	J	SBAST-2	1/13	340 - 680	380	NE	4,100,000	RBC	No	BSL
108-95-2	Phenol	90	J	90	J	SBAST-2	1/13	340 - 680	90	NE	120,000,000	RBC	No	BSL
85-01-8	Phenanthrene	370	J	370	J	SBAST-2	1/13	340 - 680	370	NE	NE	NE	No	NTX
	Inorganic Compounds (in mg/kg)													
7429-90-5	Aluminum	7390		26,400	*J	SBB-1	12/12		26,400	NE	200,000	RBC	No	BSL
7440-36-0	Antimony	0.32	MWJ	0.54	BJW	SBE-1	3/11	0.39 - 0.54	0.54	NE	82	RBC	No	BSL
7440-38-2	Arsenic	0.54	BJ	0.8	BJN	SB238D-1	2/11	0.27 - 1.7	0.8	NE	3.8	RBC	No	BSL
7440-39-3	Barium	52.8	*	130		SBCSD-3	12/12		130	NE	14,000	RBC	No	BSL
7440-41-7	Beryllium	0.3		0.38		SBD-3	4/12	0.02 - 0.38	0.38	NE	110	RBC	No	BSL
7440-43-9	Cadmium	0.2	B	10.1	J	SB64D-1	12/12		10.1	NE	2060(a)	RBC	No	BSL
7440-70-2	Calcium	4450	*	68,700	*	SB238D-1	12/12		68,700	NE	NE		No	NUT, NTX
7440-47-3	Chromium	11.5		27.2	*J	SBB-1	12/12		27.2	NE	210(b)	RBC	No	BSL
7440-48-4	Cobalt	9.4	J	22.3	N	SB64D-1	12/12		22.3	NE	12,000	RBC	No	BSL
7440-50-8	Copper	29.3	J*	104	*	SB64D-1	12/12		104	NE	8,200	RBC	No	BSL
7439-89-6	Iron	18100		39,500	*J	SBB-1	12/12		39,500	NE	61,000	RBC	No	NUT
7439-92-1	Lead	1.6	JN*	89.9	N*	SBE-1	11/12	1.8 - 89.9	89.9	NE	500	RBC	No	BSL
7439-95-4	Magnesium	3410		10,800		SBB-1	12/12		10,800	NE	NE		No	NUT, NTX
7439-96-5	Manganese	556	NJ	739		SBB-1	5/5		739	NE	4100(c)	RBC	No	BSL
7439-97-6	Mercury	0.16		0.16		SBB-1	3/12	0.1 - 0.16	0.16	NE	2.3(d)	SSL	No	BSL
7440-02-0	Nickel	6.3	BJN	18.9	*J	SBB-1	12/12		18.9	NE	4,100	RBC	No	BSL
7440-09-7	Potassium	961	BE	7,150	BE	SBCSD-3	12/12		7,150	NE	NE		No	NUT, NTX
7782-49-2	Selenium	1.6	*	2	*	SBCSD-3	4/11	0.48 - 1.6	2	NE	1,000	RBC	No	BSL
7440-22-4	Silver	0.83	BJN	0.83	BJN	SB238D-1	1/9	0.12 - 1.4	0.83	NE	1,000	RBC	No	BSL
7440-23-5	Sodium	418	BE	7,150	BE	SBCSD-3	11/11		7,150	NE	NE		No	NUT, NTX
7440-62-2	Vanadium	57.4	*	165	NJ	SBB-1	12/12		165	NE	1,400	RBC	No	BSL
7440-66-6	Zinc	50.3	*J	7,830	EN	SB64D-1	6/6		7,830	NE	61,000	RBC	No	BSL
57-12-5	Cyanide	60.2	N*J	60.2	N*J	SBB-1	1/18	0.55 - 60.2	60.2	NE	4,100	RBC	No	BSL

Notes:

Data used from 1 to 12 foot intervals
J - Estimated value
B - Result is between instrument detection limit (IDL) and Contract Required Detection Limit (CRDL)
* - Duplicate analysis not within control limits
E - Estimated due to the presence of interference
(a) - based on cadmium as food
(b) - based on hexavalent chromium
(c) - based on manganese as nonfood
M - Duplicate injection precision not met
N - Spike recovery not within control limits
W - GFAA post-digest spike out of control limits
NE - None Established
COPC - Chemical of potential concern
(d) - based on EPA SSLs HQ = 0.1
ARAR/TBC - Applicable or relevant and appropriate requirement/To be considered
RBC - Risk-Based Concentration for industrial use soil (USEPA Region 3, October 1999), based on HQ = 0.1
BSL - Below screening levels
NUT - Essential nutrient
NTX - No toxicity criteria

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TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Virgin Island Chemical Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil/Air
Exposure Point: VICHEM Site

Chemical of Potential Concern	Units	Arithmetic Mean	95th UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure (1) (RME)			Central Tendency (1) (CT)		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	mg/kg	2.18	NA	8.8		mg/kg	6.83	95th UCL-T	W-Test(2)	6.83	95th UCL-T	W-Test(2)
Chromium	mg/kg	21.7	26	32.0		mg/kg	26	95th UCL - N	W-Test(3)	26	95th UCL - N	W-Test(3)
Iron	mg/kg	31,363	NA	63,400	*J	mg/kg	40,921	95th UCL-T	W-Test(2)	40,921	95th UCL-T	W-Test(2)
Manganese	mg/kg	782	NA	1,980		mg/kg	1,060	95th UCL-T	W-Test(2)	1,060	95th UCL-T	W-Test(2)
Vanadium	mg/kg	79.5	109	155	NJ	mg/kg	109	95th UCL - N	W-Test(3)	109	95th UCL - N	W-Test(3)
Zinc	mg/kg	792	NA	5,790	E*J	mg/kg	3,731	95th UCL-T	W-Test(2)	3,731	95th UCL-T	W-Test(2)

(1) The 95th UCL values were used to represent the EPC for both the RME & CT receptor

(2) Shapiro-Wilk W Test indicates data are log-normally distributed

(3) Shapiro-Wilk W Test indicates data are normally distribued

NA - Not applicable

*- Duplicate analysis not within control limits

J- Estimated Value

E - estimated due to presence of interference

95th UCL-T= 95th UCL of Log-transformed Data

95th UCL-N = 95th UCL of Untransformed Data

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TABLE 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Virgin Island Chemical Site

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment/Air
Exposure Point: Gut System

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure (1) (RME)			Central Tendency (1) (CT)		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	mg/kg	9861	11396	16600		mg/kg	11396	95th UCL-N	W-Test(3)	11396	95% UCL-N	W-Test(3)
Arsenic	mg/kg	0.94	NA	2.8	J	mg/kg	1.63	95%UCL-T	W-Test (2)	1.63	95%UCL-T	W-Test (2)
Chromium	mg/kg	13.8	NA	39	J	mg/kg	18.6	95%UCL-T	W-Test (2)	18.6	95%UCL-T	W-Test (2)
Iron	mg/kg	16,150	18,995	28,850		mg/kg	18,995	95th UCL-N	W-Test(3)	18,995	95% UCL-N	W-Test(3)
Manganese	mg/kg	414	488	792	J	mg/kg	486	95th UCL-N	W-Test(3)	486	95% UCL-N	W-Test(3)
Vanadium	mg/kg	49	57	85.9		mg/kg	49	95th UCL-N	W-Test(3)	49	95% UCL-N	W-Test(3)

(1) The 95% UCL values were used to represent the EPC for both the RME & CT receptor
(2) Shapiro-Wilk W Test indicates data are log-normally distributed
(3) Shapiro-Wilk W Test indicates data are normally distributed
NA - Not applicable
J- Estimated Value
95% UCL-N -95% UCL of Normal Data
95% UCL-T- 95% UCL of Log-transformed Data

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TABLE 3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater/Air
Exposure Point: Local Aquifers (Alluvium & Kingshill)

Chemical of Potential Concern	Units	Arithmetic Mean	95th UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure (1) (RME)			Central Tendency (1) (CT)		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Acetone	µg/L	231	NA	7,800	BJ	µg/L	187	95th UCL-T	W-Test(2)	187	95th UCL-T	W-Test(2)
Chloroform	µg/L	229	NA	3,800		µg/L	865	95th UCL-T	W-Test(2)	865	95th UCL-T	W-Test(2)
Ethylbenzene	µg/L	950	NA	22,000		µg/L	280	95th UCL-T	W-Test(2)	280	95th UCL-T	W-Test(2)
Methylene Chloride	µg/L	119	NA	4,300	BJ	µg/L	40	95th UCL-T	W-Test(2)	40	95th UCL-T	W-Test(2)
Toluene	µg/L	30.4	NA	590	J	µg/L	30.9	95th UCL-T	W-Test(2)	30.9	95th UCL-T	W-Test(2)
Xylenes	µg/L	4651	NA	110,000		µg/L	960	95th UCL-T	W-Test(2)	960	95th UCL-T	W-Test(2)
2,4-Dimethylphenol	µg/L	13.4	NA	110	J	µg/L	17.2	95th UCL-T	W-Test(2)	17.2	95th UCL-T	W-Test(2)
Isophorone	µg/L	12	NA	75		µg/L	17.6	95th UCL-T	W-Test(2)	17.6	95th UCL-T	W-Test(2)
2-Methylphenol	µg/L	20.3	NA	200		µg/L	24.1	95th UCL-T	W-Test(2)	24.1	95th UCL-T	W-Test(2)
Antimony	µg/L	1.97	NA	6.2	BJ	µg/L	2.49	95th UCL-T	W-Test(2)	2.49	95th UCL-T	W-Test(2)
Arsenic	µg/L	1.15	NA	5.2	BJ	µg/L	1.4	95th UCL-T	W-Test(2)	1.4	95th UCL-T	W-Test(2)
Barium	µg/L	119	NA	508		µg/L	160	95th UCL-T	W-Test(2)	160	95th UCL-T	W-Test(2)
Chromium	µg/L	3.66	NA	25.7		µg/L	5.06	95th UCL-T	W-Test(2)	5.06	95th UCL-T	W-Test(2)
Iron	µg/L	1750	NA	10,100		µg/L	10100	MAX	(4)	10100	MAX	(4)
Lead	µg/L	4.31	NA	50.7		µg/L	7.3	95th UCL-T	W-Test(2)	7.3	95th UCL-T	W-Test(2)
Manganese	µg/L	1150	1614	3,570		µg/L	1614	95th UCL-N	W-Test(3)	1614	95th UCL-N	W-Test(3)
Vanadium	µg/L	20	25	58.6		µg/L	25	95th UCL-N	W-Test(3)	25	95th UCL-N	W-Test(3)

(1) The 95th UCL values were used to represent the EPC for both the RME & CT receptor
(2) Shapiro-Wilk W Test indicates data are log-normally distributed
(3) Shapiro-Wilk W Test indicates data are normally distributed
(4) - 95th UCL value exceeds maximum value; therefore, maximum concentration used
NA - Not applicable
95th UCL-N -95th UCL of Normal Data
95th UCL-T- 95th UCL of Log-transformed Data
B- Result is in between instrument detection limit (IDL) and Contract Required Detection Limit (CRDL)
J- Estimated Value

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TABLE 4.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil/Air
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a	3,285	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	104	SS	52	SS	
	ED	Exposure Duration	yr	30	EPA 1991a	9	EPA 1996a	
	IR-S	Ingestion Rate-Soil	mg/kg	50	EPA 1996a	50	EPA 1996a	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	
Dermal	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a	3,285	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	52	EPA 1989	
	EF	Exposure Frequency	d/yr	104	SS	104	SS	
	ED	Exposure Duration	yr	30	EPA 1991a	9	EPA 1996a	
	DABS	Dermal Absorption Factor-(As)	unitless	0.03	EPA 1999	0.03	EPA 1999	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.07	EPA 1999	0.01	EPA 1999	
	SA	Skin Surface Area	cm^2/day	5700	EPA 1999	5700	EPA 1999	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	
Inhalation	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x ED x EF x ET x IN) ÷ (BW x AT x PEF)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a	3,285	EPA 1991a	
	PEF	Particulate Emmision Factor	m^3/kg	1.32×10^9	EPA 1996b	1.32×10^9	EPA 1996b	
	EF	Exposure Frequency	d/yr	104	SS	52	SS	
	ED	Exposure Duration	yr	30	EPA 1991a	9	EPA 1996a	
	ET	Exposure Time	hr/day	4	SS	2	SS	
	IN	Inhalation Rate	m^3/hr	0.833	EPA 1989	0.833	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	

RME: Reasonable Maximum Exposure

SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.
EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.
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EPA 1996b, Soil Screening Guidance, EPA/540/R-95/128
EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

303957

TABLE 4.2
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil/Air
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT (1) Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	45	EPA 1996a			(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 1991a			
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	5	EPA 1989			
	IR-S	Ingestion Rate-Soil	mg/kg	100	EPA 1996a			
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1			
Dermal	BW	Body Weight	kg	45	EPA 1996a			(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 1991a			
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	5	EPA 1989			
	DABS	Dermal Absorption Factor - (As)	unitless	0.03	EPA 1999			
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.2	EPA 1999			
	SA	Skin Surface Area	cm^2/day	2800	EPA 1999			
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1			
Inhalation	BW	Body Weight	kg	45	EPA 1996a			(CS x ED x EF x ET x IN) ÷ (BW x AT x PEF)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 1991a			
	PEF	Particulate Emmision Factor	m^3/kg	1.32×10^{9}	EPA 1996b			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	5	EPA 1989			
	ET	Exposure Time	hr/day	4	SS			
	IN	Inhalation Rate	m^3/hr	0.420	EPA 1989			
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1			

RME: Reasonable Maximum Exposure
CT (1): Central Tendency was only evaluated when RME risk and hazard estimates exceeded acceptable benchmarks (10^{-6} - carcinogens, 1.0 - noncarcinogens).
SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.
EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.
EPA 1992, Dermal Exposure Assessment: Principles and Applications. Interim Report. January 1992. EPA/600/8-91/011B
EPA 1996a, Exposure Factors Handbook, EPA/600/P-95/002Ba
EPA 1996b, Soil Screening Guidance, EPA/540/R-95/128
EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

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TABLE 4.3
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment, Air
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT (1) Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	70	EPA 1991a			(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a			
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	30	EPA 1991a			
	IR-S	Ingestion Rate-Soil/Sediment	mg/kg	50	EPA 1996a			
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2			
Dermal	BW	Body Weight	kg	70	EPA 1991a			(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a			
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	30	EPA 1991a			
	DABS	Dermal Absorption Factor - (As)	unitless	0.03	EPA 1999			
	SSAF	Soil to Skin Adherence Factor.	mg/cm^2	0.07	EPA 1999			
	SA	Skin Surface Area	cm^2/day	5700	EPA 1999			
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2			
Inhalation	BW	Body Weight	kg	70	EPA 1991a			(CS x ED x EF x ET x IN) ÷ (BW x Atx PEF)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a			
	PEF	Particulate Emmision Factor	m^3/kg	1.32×10^9	EPA 1996b			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	30	EPA 1991a			
	ET	Exposure Time	hr/day	4	SS			
	IN	Inhalation Rate	m^3/hr	0.833	EPA 1989			
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2			

RME: Reasonable Maximum Exposure

CT (1): Central Tendency was only evaluated when RME risk and hazard estimates exceeded acceptable benchmarks (10^{-6} - carcinogens, 1.0 - noncarcinogens).

SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002

EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.

EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.

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EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

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TABLE 4.4
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment, Air
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Pre-adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT (1) Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	45	EPA 1996a			(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 1991a			
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	5	EPA 1989			
	IR-S	Ingestion Rate-Soil/Sediment	mg/kg	100	EPA 1996a			
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2			
Dermal	BW	Body Weight	kg	45	EPA 1996			(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 1991a			
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	5	EPA 1989			
	DABS	Dermal Absorption Factor - (As)	unitless	0.03	EPA 1999			
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.2	EPA 1999			
	SA	Skin Surface Area	cm^2/day	2800	EPA 1999			
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2			
Inhalation	BW	Body Weight	kg	45	EPA 1996a			(CS x ED x EF x ET x IN) ÷ (BW x AT x PEF)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a			
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 1991a			
	PEF	Particulate Emmision Factor	m^3/kg	1.32×10^9	EPA 1996b			
	EF	Exposure Frequency	d/yr	104	SS			
	ED	Exposure Duration	yr	5	EPA 1989			
	ET	Exposure Time	hr/day	4	SS			
	IN	Inhalation Rate	m^3/hr	0.420	EPA 1989			
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2			

RME: Reasonable Maximum Exposure

CT (1): Central Tendency was only evaluated when RME risk and hazard estimates exceeded acceptable benchmarks (10^{-6} - carcinogens, 1.0 - noncarcinogens).

SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.
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EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

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TABLE 4.5
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater/Air
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT (1) Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	70	EPA 1991	70	EPA 1991	(CW x ED x EF x IR-W) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991	25,550	EPA 1991	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991	2,409	EPA 1991	
	EF	Exposure Frequency	d/yr	250	EPA 1991	250	EPA 1991	
	ED	Exposure Duration	yr	25	EPA 1991	6.6	EPA 1996a	
	IR-W	Ingestion Rate-Water	L/d	1.2	EPA 1996a	0.7	EPA 1996a	
	CW	Chemical Concentration in Water	mg/L	See Table 3-3	See Table 3-3	See Table 3-3	See Table 3-3	
Dermal	BW	Body Weight	kg	70	EPA 1991	70	EPA 1991	(CW x CF x EF x ED x ET x Kp x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991	25,550	EPA 1991	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991	2,409	EPA 1991	
	CF	Conversion Factor	L/cm^3	0.001	EPA 1995	0.001	EPA 1995	
	EF	Exposure Frequency	d/yr	250	EPA 1991	250	EPA 1991	
	ED	Exposure Duration	yr	25	EPA 1991	6.6	EPA 1996	
	ET	Exposure Time	hr/day	8	EPA 1991	8	EPA 1991	
	SA	Skin Surface Area	cm^2	3300	EPA 1999	3300	EPA 1999	
	Kp	Permeablity Coefficient						
		ACETONE	cm/hr	5.69E-04	EPA 1992	5.69E-04	EPA 1992	
		CHLOROFORM	cm/hr	8.90E-03	EPA 1992	8.90E-03	EPA 1992	
		ETHYLBENZENE	cm/hr	7.40E-02	EPA 1992	7.40E-02	EPA 1992	
		METHYLENE CHLORIDE	cm/hr	4.50E-03	EPA 1992	4.50E-03	EPA 1992	
		XYLENES	cm/hr	8.00E-02	EPA 1992	8.00E-02	EPA 1992	
		ISOPHORONE	cm/hr	4.40E-03	EPA 1992	4.40E-03	EPA 1992	
		2,4-DIMETHYLPHENOL	cm/hr	1.50E-02	EPA 1992	1.50E-02	EPA 1992	
		2-METHYLPHENOL	cm/hr	1.00E-02	EPA 1992	1.01E-02	EPA 1992	
		TOLUENE	cm/hr	4.50E-02	EPA 1992	4.50E-02	EPA 1992	
		CHROMIUM(VI)	cm/hr	2.00E-03	EPA 1992	2.00E-03	EPA 1992	
		ARSENIC	cm/hr	2.70E-06	Hrudey, 1996	2.70E-06	Hrudey, 1996	
		ANTIMONY(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		BARIUM(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		IRON(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		MANGANESE(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		VANADIUM(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
	CW	Chemical Concentration in Water	mg/L	See Table 3-3	See Table 3-3	See Table 3-3	See Table 3-3	
Inhalation	BW	Body Weight	kg	70	EPA 1991	70	EPA 1991	(CW x ED x EF x ET x K x IN) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991	25,550	EPA 1991	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991	2,409	EPA 1991	
	EF	Exposure Frequency	d/yr	250	EPA 1991	250	EPA 1991	
	ED	Exposure Duration	yr	25	EPA 1991	6.6	EPA 1996	
	ET	Exposure Time	hr/day	8	EPA 1991	8	EPA 1991	
	K	Volatilization Factor	L/m^3	0.5	EPA 1991b	0.5	EPA 1991b	
	IN	Inhalation Rate	m^3/hr	0.833	EPA 1989	0.833	EPA 1989	
	CW	Chemical Concentration in Water	mg/L	See Table 3-3	See Table 3-3	See Table 3-3	See Table 3-3	

RME: Reasonable Maximum Exposure

CT (1): Central Tendency was only evaluated when RME risk and hazard estimates exceeded acceptable benchmarks (10^{-6} - carcinogens, 1.0 - noncarcinogens).

SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002

EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. Mar

EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.

EPA 1992, Dermal Exposure Assessment: Principles and Applications. Interim Report. January 1992. EPA/600/8-91/011B

EPA 1996a, Exposure Factors Handbook, EPA/600/P-95/002Ba

EPA 1996b, Soil Screening Guidance, EPA/540/R-95/128

EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

(a) - metal permeability equivalent to water permeability

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TABLE 4.6
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil/Air
Exposure Point: VICHEM Site
Receptor Population: Industrial/Commercial Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT (1) Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991a	2,409	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	25	EPA 1991a	6.6	EPA 1996a	
	IR-S	Ingestion Rate-Soil	mg/kg	50	EPA 1991a	50	EPA 1991a	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	
Dermal	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991a	2,409	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	25	EPA 1991a	6.6	EPA 1996	
	DABS	Dermal Absorption Factor - (As)	unitless	0.03	EPA 1999	0.03	EPA 1999	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.2	EPA 1999	0.02	EPA 1999	
	SA	Skin Surface Area	cm^2/day	3300	EPA 1999	3300	EPA 1999	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	
Inhalation	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x ED x EF x ET x IN) ÷ (BW x AT x PEF)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991a	2,409	EPA 1991a	
	PEF	Particulate Emmision Factor	m^3/kg	1.32×10^9	EPA 1991b	1.32×10^9	EPA 1991b	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	25	EPA 1991a	6.6	EPA 1996a	
	ET	Exposure Time	hr/day	8	EPA 1991a	8	EPA 1991a	
	IN	Inhalation Rate	m^3/hr	0.833	EPA 1989	0.833	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	

RME: Reasonable Maximum Exposure

CT (1): Central Tendency was only evaluated when RME risk and hazard estimates exceeded acceptable benchmarks (10^{-6} - carcinogens, 1.0 - noncarcinogens).

SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002

EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.

EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.

EPA 1992, Dermal Exposure Assessment: Principles and Applications. Interim Report. January 1992. EPA/600/8-91/011B

EPA 1996a, Exposure Factors Handbook, EPA/600/P-95/002Ba

EPA 1996b, Soil Screening Guidance, EPA/540/R-95/128

EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

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TABLE 4.7
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment, Air
Exposure Point: Gut System
Receptor Population: Industrial/Commercial Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT (1) Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991a	2,409	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	25	EPA 1991a	6.6	EPA 1996a	
	IR-S	Ingestion Rate-Soil/Sediment	mg/kg	50	EPA 1991a	50	EPA 1991a	
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	
Dermal	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991a	2,409	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	25	EPA 1991a	6.6	EPA 1996a	
	DABS	Dermal Absorption Factor - (As)	unitless	0.03	EPA 1999	0.03	EPA 1999	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.2	EPA 1999	0.02	EPA 1999	
	SA	Skin Surface Area	cm^2/day	3300	EPA 1999	3300	EPA 1999	
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	
Inhalation	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x ED x EF x ET x IN) ÷ (BW x AT x PEF)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 1991a	2,409	EPA 1991a	
	PEF	Particulate Emmision Factor	m^3/kg	1.32×10^9	EPA 1996b	1.32×10^9	EPA 1996b	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	25	EPA 1991a	6.6	EPA 1996a	
	ET	Exposure Time	hr/day	8	EPA 1991a	8	EPA 1991a	
	IN	Inhalation Rate	m^3/hr	0.833	EPA 1989	0.833	EPA 1989	
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	

RME: Reasonable Maximum Exposure

CT (1): Central Tendency was only evaluated when RME risk and hazard estimates exceeded acceptable benchmarks (10^{-6} - carcinogens, 1.0 - noncarcinogens).

SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002

EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.

EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.

EPA 1992, Dermal Exposure Assessment: Principles and Applications. Interim Report. January 1992. EPA/600/8-91/011B

EPA 1996a, Exposure Factors Handbook, EPA/600/P-95/002Ba

EPA 1996b, Soil Screening Guidance, EPA/540/R-95/128

EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

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TABLE 4.8
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil/Air
Exposure Point: VICHEM Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT (1) Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 1991a	365	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	1	SS	1	SS	
	IR-S	Ingestion Rate-Soil	mg/kg	480	EPA, 1991a	100	EPA, 1991a	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	
Dermal	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 1991a	365	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	1	SS	1	SS	
	DABS	Dermal Absorption Factor - (As)	unitless	0.03	EPA 1999	0.03	EPA 1999	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.2	EPA 1999	0.02	EPA 1999	
	SA	Skin Surface Area	cm^2/day	3300	EPA 1999	3300	EPA 1999	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	
Inhalation	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x ED x EF x ET x IN) ÷ (BW x AT x PEF)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 1991a	365	EPA 1991a	
	PEF	Particulate Emmision Factor	m^3/kg	1.32×10^9	EPA 1996b	1.32×10^9	EPA 1996b	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	1	SS	1	SS	
	ET	Exposure Time	hr/day	8	EPA 1991a	8	EPA 1991a	
	IN	Inhalation Rate	m^3/hr	3.5	EPA 1996a	1.3	EPA 1996a	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-1	See Table 3-1	See Table 3-1	See Table 3-1	

RME: Reasonable Maximum Exposure
CT (1): Central Tendency was only evaluated when RME risk and hazard estimates exceeded acceptable benchmarks (10^{-6} - carcinogens, 1.0 - noncarcinogens).
SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.
EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.
EPA 1992, Dermal Exposure Assessment: Principles and Applications. Interim Report. January 1992. EPA/600/8-91/011B
EPA 1996a, Exposure Factors Handbook, EPA/600/P-95/002Ba
EPA 1996b, Soil Screening Guidance, EPA/540/R-95/128
EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

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TABLE 4.9
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment, Air
Exposure Point: Gut System
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT (1) Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 1991a	365	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	1	SS	1	SS	
	IR-S	Ingestion Rate-Soil/Sediment	mg/kg	480	EPA, 1991a	100	EPA, 1991a	
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	
Dermal	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 1991a	365	EPA 1991a	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	1×10^{-6}	EPA 1989	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	1	SS	1	SS	
	DABS	Dermal Absorption Factor - (As)	unitless	0.03	EPA 1999	0.03	EPA 1999	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.2	EPA 1999	0.02	EPA 1999	
	SA	Skin Surface Area	cm^2/day	3300	EPA 1999	3300	EPA 1999	
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	
Inhalation	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CS x ED x EF x ET x IN) ÷ (BW x AT x PEF)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 1991a	365	EPA 1991a	
	PEF	Particulate Emmision Factor	m^3/kg	1.32×10^{9}	EPA 1996b	1.32×10^{9}	EPA 1996b	
	EF	Exposure Frequency	d/yr	250	EPA 1991a	250	EPA 1991a	
	ED	Exposure Duration	yr	1	SS	1	SS	
	ET	Exposure Time	hr/day	8	EPA 1991a	8	EPA 1991a	
	IN	Inhalation Rate	m^3/hr	3.5	EPA 1996a	1.3	EPA 1996a	
	CS	Chemical Concentration in Soil/Sediment	mg/kg	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	

RME: Reasonable Maximum Exposure

CT (1): Central Tendency was only evaluated when RME risk and hazard estimates exceeded acceptable benchmarks (10^{-6} - carcinogens, 1.0 - noncarcinogens).

SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002

EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.

EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.

EPA 1992, Dermal Exposure Assessment: Principles and Applications. Interim Report. January 1992. EPA/600/8-91/011B

EPA 1996a, Exposure Factors Handbook, EPA/600/P-95/002Ba

EPA 1996b, Soil Screening Guidance, EPA/540/R-95/128

EPA 1999, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Supplemental Guidance - Dermal Risk Assessment, Interim Guidance, March 2, 1999

TABLE 4.10
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater/Air
Exposure Point: Tap water/Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CW x ED x EF x IR-W) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a	3,285	EPA 1991a	
	EF	Exposure Frequency	d/yr	350	EPA 1991a	350	EPA 1991a	
	ED	Exposure Duration	yr	30	EPA 1996a	9	EPA 1996a	
	IR-W	Ingestion Rate-Water	L/d	2.4	EPA 1996a	1.4	EPA 1996a	
	CW	Chemical Concentration in Water	mg/L	See Table 3-3	See Table 3-3	See Table 3-3	See Table 3-3	
Dermal	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(CW x CF x EF x ED x ET x Kp x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a	3,285	EPA 1991a	
	CF	Conversion Factor	L/cm^3	0.001	EPA 1995	0.001	EPA 1995	
	EF	Exposure Frequency	d/yr	350	EPA 1991a	350	EPA 1991a	
	ED	Exposure Duration	yr	30	EPA 1996a	9	EPA 1996a	
	ET	Exposure Time (shower)	hr/day	0.53	EPA 1996a	0.17	EPA 1997	
	SA	Skin Surface Area	cm^2	18,150	EPA 1996a	18,150	EPA 1996a	
	Kp	Permeablity Coefficient						
		ACETONE	cm/hr	5.69E-04	EPA 1992	5.69E-04	EPA 1992	
		CHLOROFORM	cm/hr	8.90E-03	EPA 1992	8.90E-03	EPA 1992	
		ETHYLBENZENE	cm/hr	7.40E-02	EPA 1992	7.40E-02	EPA 1992	
		METHYLENE CHLORIDE	cm/hr	4.50E-03	EPA 1992	4.50E-03	EPA 1992	
		XYLENES	cm/hr	8.00E-02	EPA 1992	8.00E-02	EPA 1992	
		ISOPHORONE	cm/hr	4.40E-03	EPA 1992	4.40E-03	EPA 1992	
		2,4-DIMETHYLPHENOL	cm/hr	1.50E-02	EPA 1992	1.50E-02	EPA 1992	
		2-METHYLPHENOL	cm/hr	1.00E-02	EPA 1992	1.01E-02	EPA 1992	
		TOLUENE	cm/hr	4.50E-02	EPA 1992	4.50E-02	EPA 1992	
		CHROMIUM(VI)	cm/hr	2.00E-03	EPA 1992	2.00E-03	EPA 1992	
		ARSENIC	cm/hr	2.70E-06	Hrudey, 1996	2.70E-06	Hrudey, 1996	
		ANTIMONY(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		BARIUM(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		IRON(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		MANGANESE(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		VANADIUM(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
	CW	Chemical Concentration in Water	mg/L	See Table 3-3	See Table 3-3	See Table 3-3	See Table 3-3	
Inhalation	BW	Body Weight	kg	70	EPA 1991a	70	EPA 1991a	(C(air) x ED x EF x ET x IN) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	10,950	EPA 1991a	3,285	EPA 1991a	
	EF	Exposure Frequency	d/yr	350	EPA 1991a	350	EPA 1991a	
	ED	Exposure Duration	yr	30	EPA 1996a	9	EPA 1996a	
	ET	Exposure Time (shower)	hr/day	0.53	EPA 1991a	0.17	EPA 1997	
	IN	Inhalation Rate	m^3/hr	0.833	EPA 1989	0.833	EPA 1989	
	C(air)	Chemical Concentration in air	mg/m^3	calculated	--	calculated	--	

RME: Reasonable Maximum Exposure
CT: Central Tendency
EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03, March.
EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.
EPA 1992, Dermal Exposure Assessment: Principles and Applications. Interim Report. January 1992. EPA/600/8-91/011B
EPA 1996a, Exposure Factors Handbook, EPA/600/P-95/002Ba
EPA, 1997, Exposure Factors Handbook, volume I (General Factors) and Volume III (Activity Factors), EPA/600/P-95/002Fa and EPA/600/P-95/002Fc, August 1997.
C(air) was calculated using the Andelman Shower Model, with inputs from the USEPA 1997 Exposure Factors Handbook and USEPA recommendations.

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TABLE 4.1.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater/Air
Exposure Point: Tap water/Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	15	EPA 1991a	15	EPA 1991a	(CW x ED x EF x IR-W) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	2,190	EPA 1991a	2,190	EPA 1991a	
	EF	Exposure Frequency	d/yr	350	EPA 1991a	350	EPA 1991a	
	ED	Exposure Duration	yr	6	EPA 1989	6	EPA 1989	
	IR-W	Ingestion Rate-Water	L/d	1.5	EPA 1996a	0.87	EPA 1996a	
	CW	Chemical Concentration in Water	mg/L	See Table 3-3	See Table 3-3	See Table 3-3	See Table 3-3	
Dermal	BW	Body Weight	kg	15	EPA 1991a	15	EPA 1991a	(CW x CF x EF x ED x ET x Kp x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	2,190	EPA 1991a	2,190	EPA 1991a	
	CF	Conversion Factor	L/cm^3	0.001	EPA 1995	0.001	EPA 1995	
	EF	Exposure Frequency	d/yr	350	EPA 1991a	350	EPA 1991a	
	ED	Exposure Duration	yr	6	EPA 1996a	6	EPA 1996a	
	ET	Exposure Time (bath)	hr/day	0.53	EPA 1996a	0.17	EPA 1997	
	SA	Skin Surface Area	cm^2	7,195	EPA 1996a	7,195	EPA 1996a	
	Kp	Permeablity Coefficient						
		ACETONE	cm/hr	5.69E-04	EPA 1992	5.69E-04	EPA 1992	
		CHLOROFORM	cm/hr	8.90E-03	EPA 1992	8.90E-03	EPA 1992	
		ETHYLBENZENE	cm/hr	7.40E-02	EPA 1992	7.40E-02	EPA 1992	
		METHYLENE CHLORIDE	cm/hr	4.50E-03	EPA 1992	4.50E-03	EPA 1992	
		XYLENES	cm/hr	8.00E-02	EPA 1992	8.00E-02	EPA 1992	
		ISOPHORONE	cm/hr	4.40E-03	EPA 1992	4.40E-03	EPA 1992	
		2,4-DIMETHYLPHENOL	cm/hr	1.50E-02	EPA 1992	1.50E-02	EPA 1992	
		2-METHYLPHENOL	cm/hr	1.00E-02	EPA 1992	1.01E-02	EPA 1992	
		TOLUENE	cm/hr	4.50E-02	EPA 1992	4.50E-02	EPA 1992	
		CHROMIUM(VI)	cm/hr	2.00E-03	EPA 1992	2.00E-03	EPA 1992	
		ARSENIC	cm/hr	2.70E-06	Hrudey, 1996	2.70E-06	Hrudey, 1996	
		ANTIMONY(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		BARIUM(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		IRON(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		MANGANESE(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
		VANADIUM(a)	cm/hr	1.00E-03	EPA 1992	1.00E-03	EPA 1992	
	CW	Chemical Concentration in Water	mg/L	See Table 3-3	See Table 3-3	See Table 3-3	See Table 3-3	
Inhalation	BW	Body Weight	kg	15	EPA 1991a	15	EPA 1991a	(C(air) x ED x EF x ET x IN) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 1991a	25,550	EPA 1991a	
	AT-N	Averaging Time NonCarcinogen	days	2,190	EPA 1991a	2,190	EPA 1991a	
	EF	Exposure Frequency	d/yr	350	EPA 1991a	350	EPA 1991a	
	ED	Exposure Duration	yr	6	EPA 1996	6	EPA 1996	
	ET	Exposure Time (shower)	hr/day	0.53	EPA 1991a	0.17	EPA 1997	
	IN	Inhalation Rate	m^3/hr	0.42	EPA 1989	0.42	EPA 1989	
	C(air)	Chemical Concentration in air	mg/m^3	calculated	--	calculated	--	

RME: Reasonable Maximum Exposure
CT: Central Tendency
EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 1991a, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part A), Supplemental Guidance, "Standard Default Exposure Factors". OSWER Directive 9285.6-03. March.
EPA 1991b, Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim. December.
EPA 1992, Dermal Exposure Assessment: Principles and Applications. Interim Report. January 1992. EPA/600/8-91/011B
EPA 1996a, Exposure Factors Handbook, EPA/600/P-95/002Ba
EPA, 1997, Exposure Factors Handbook, volume I (General Factors) and Volume III (Activity Factors), EPA/600/P-95/002Fa and EPA/600/P-95/002Fc, August 1997.
C(air) was calculated using the Andelman Shower Model, with inputs from the USEPA 1997 Exposure Factors Handbook and USEPA recommendations.

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
Virgin Island Chemical Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor[1]	Adjusted Dermal RfD	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ[2] (MM/DD/YY)
Acetone[3]	subchronic	1.00E-01	mg/kg/d	100%	1.00E-01	mg/kg/d	liver and kidney	1000/1	IRIS	1/15/99
Chloroform[4]	chronic	1.00E-02	mg/kg/d	100%	1.00E-02	mg/kg/d	liver	1000/1	IRIS	1/15/99
Ethylbenzene[4]	subchronic/chronic	1.00E-01	mg/kg/d	82%	8.20E-02	mg/kg/d	liver and kidney	1000/1	IRIS	1/15/99
Methylene chloride[4]	chronic	6.00E-02	mg/kg/d	100%	6.00E-02	mg/kg/d	liver	100/1	IRIS	1/15/99
Toluene[5]	subchronic	2.00E-01	mg/kg/d	80%	1.60E-01	mg/kg/d	liver/kidney	1000/1	IRIS	10/15/99
Xylenes[4]	chronic	2.00E+00	mg/kg/d	100%	2.00E+00	mg/kg/d	CNS	100/1	IRIS	1/15/99
Isophorone[6]	subchronic	2.00E-01	mg/kg/d	100%	2.00E-01	mg/kg/d	kidney	1000/1	IRIS	1/15/99
2,4-Dimethylphenol[5]	subchronic	2.00E-02	mg/kg/d	100%	2.00E-02	mg/kg/d	hematological	3000/1	IRIS	10/15/99
2-Methylphenol[5]	subchronic	5.00E-02	mg/kg/d	100%	5.00E-02	mg/kg/d	CNS	1000/1	IRIS	10/15/99
Aluminum[5]	NA	1.00E+00	mg/kg/d	20%	2.00E-01	mg/kg/d	gastrointestinal disturbances	NA	RBC	04/01/99
Arsenic[4]	chronic	3.00E-04	mg/kg/d	98%	2.94E-04	mg/kg/d	skin	3/1	IRIS	1/15/99
Antimony[5]	chronic	4.00E-04	mg/kg/d	20%	8.00E-05	mg/kg/d	longevity, blood glucose, cholesterol	1000/1	IRIS	10/15/99
Barium[5]	subchronic	7.00E-02	mg/kg/d	20%	1.40E-02	mg/kg/d	kidney	3/1	IRIS	10/15/99
Chromium (VI)[5]	subchronic	3.00E-03	mg/kg/d	2%	6.00E-05	mg/kg/d	NOAEL	300/3	IRIS/Hrudey, et al., 1996	09/03/98
Iron[7,8]	chronic	3.00E-01	mg/kg/d	10%	3.00E-02	mg/kg/d	liver, heart, pancreas	1/NA	NCEA	7/23/96
Manganese (nonfood)[7]	chronic	2.00E-02	mg/kg/d	10%	2.00E-03	mg/kg/d	CNS	NA/3	IRIS	9/26/98
Vanadium[5,8b]	chronic	7.00E-03	mg/kg/d	20%	1.40E-03	mg/kg/d	decreased hair cystine	100/1	HEAST	7/97
Zinc[5]	subchronic	3.00E-01	mg/kg/d	20%	6.00E-02	mg/kg/d	blood	3/1	IRIS	3/1/97

(1) RfDo adjusted = RfDo*Adjustment Factor (USEPA, 1989).
(2) IRIS (Integrated Risk Information Service) search date or EPA-NCEA (National Center for Environmental Assessment) literature date.
(3) Oral to dermal adjustment factor obtained from ATSDR Toxicological Profile for Acetone, EPA 1993.
(4) Oral to dermal adjustment factor obtained from Owen, B.A. (1990) Literature-Derived Absorption Coefficients for 39 Chemicals via Oral and Inhalation Routes of Exposure. Regul. Toxicol. Pharm. 11:237-252.
(5) Oral to dermal adjustment factor obtained from USEPA Region IV Waste Management Division, OTS Guidance, 1997.
(6) Oral to dermal adjustment factor obtained from ATSDR Toxicological Profile for Isophorone, EPA 1989.
(7) Oral to dermal adjustment factor obtained from USEPA Health Effects Assessment Summary Tables (HEAST) 1997.
(8) Oral reference dose listed is EPA-NCEA provisional value.

NA - Not Available
CNS - central nervous system
RBC - USEPA Region III Risk-Based Concentration Tables, October 1999

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TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
Virgin Island Chemical Site

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (MM/DD/YY)
Acetone		NE		NE					
Chloroform	chronic	3.0E-04	mg/m^3	8.60E-05	mg/kg/d	liver, kidney	1000/NA	NCEA	12/01/97
Ethylbenzene	subchronic	1.00E+00	mg/m^3	2.90E-01	mg/kg/d	reproductive system (developmental toxicity)	300/1	IRIS	1/15/99
Methylene chloride	subchronic/ chronic	3.00E+00	mg/m^3	8.60E-01	mg/kg/d	liver	100/NA	HEAST	7/97
Toluene	chronic	4.00E-01	mg/m^3	1.14E-01	mg/kg/d	neurological effects	300/1	IRIS	8/1/92
Xylenes		NE		NE					
2,4-Dimethylphenol		NE		NE					
Isophorone		NE		NE					
2-Methylphenol		NE		NE					
Aluminum		NE		1.00E-03	mg/kg/d			NCEA	--
Arsenic		NE		NE					
Chromium	subchronic	3.E-05	mg/m^3	3.00E-05	mg/kg/d	Lung	300/1	HEAST	7/97
Iron		NE		NE					
Manganese	chronic	5.00E-05	mg/m^3	1.43E-05	mg/kg/d	CNS	1000/1	HEAST	7/97
Vanadium		NE		NE					
Zinc		NE		NE					

(1) For those COPCs with no inhalation RfC, the oral RfD was used to assess exposure via inhalation.
(2) IRIS (Integrated Risk Information Service) search date, EPA-NCEA (National Center for Environmental Assessment) literature date, or HEAST (Health Effects Assessment Summary Tables) reference date.
NE - Not established
NA - Not available
CNS - central nervous system
RBC - USEPA Region III Risk-Based Concentration Table, October 1999.

303969

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
Virgin Island Chemical Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor [1]	Units	Weight of Evidence/ Cancer Guideline Description	Source Target Organ	Date [2] (MM/DD/YY)
Chloroform[3]	6.10E-03	100%	6.10E-03	1/mg/kg/d	B2	Kidney	1/15/99
Methylene chloride[3]	7.50E-03	100%	7.50E-03	1/mg/kg/d	B2	Liver	1/15/99
Isophorone[4]	9.50E-04	100%	9.50E-04	1/mg/kg/d	C	Kidney	1/15/99
2-Methylphenol	NE		NE		C	skin	8/1/91
Arsenic[3]	1.50E+00	98%	1.47E+00	1/mg/kg/d	A	Liver, kidney, lung, bladder	1/15/99

(1) CSFo adjusted = CSFo/Adjustment Factor (USEPA, 1989).
(2) IRIS (Integrated Risk Information Service) search date.
(3) Oral to dermal adjustment factor obtained from Owen, B.A. (1990) Literature-Derived Absorption Coefficients for 39 Chemicals via Oral and Inhalation Routes of Exposure. Regul. Toxicol. Pharm. 11:237-252.
(4) Oral to dermal adjustment factor obtained from ATSDR Toxicological Profile for Isophorone, EPA 1989.
EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity
NE - not established

303970

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
Virgin Island Chemical Site

Chemical of Potential Concern	Unit Risk	Units	Adjustment [1]	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date [2] (MM/DD/YY)
Chloroform	2.30E-05	ug/m^3	3,500	8.10E-02	1/mg/kg/d	B2	IRIS	1/15/99
Methylene chloride	4.70E-07	ug/m^3	3,500	1.65E-03	1/mg/kg/d	B2	IRIS	1/15/99
Isophorone	NE			NE				
Arsenic	4.30E-03	ug/m^3	3,500	1.51E+01	1/mg/kg/d	A	IRIS	1/15/99
Chromium (VI)	1.20E-02	ug/m^3	3,500	4.20E+01	1/mg/kg/d	A	IRIS	9/3/98

(1) Adjustment factor applied to unit risk to calculate inhalation slope factor = 70 kg x 1/20 m^3/day x 1000 ug/mg
(2) IRIS (Integrated Risk Information Service) search date.
NE - Not established
EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

303971

TABLE 7.1 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	1.39E-06	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	4.6E-03
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	5.19E-06	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	1.7E-03
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	8.33E-03	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	2.8E-02
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	2.16E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	1.1E-02
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	2.22E-05	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	3.2E-03
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	7.59E-04	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	2.5E-03
	(Total)												5.1E-02
Dermal	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	3.33E-07	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	1.1E-03
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.03E+03	mg/kg	1.03E+03	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	NA
	(Total)												1.1E-03
												Total Hazard Index Across All Exposure Routes/Pathways	5.2E-02

M - Medium-Specific EPC selected for hazard calculation.
NA - Not applicable.
NE - Not established.

303972

TABLE 7.2 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	2.62E-10	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	8.7E-06
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	1.09E-08	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	7.6E-04
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	7.7E-04

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303973

TABLE 7.3 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	4.32E-06	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	1.4E-02
	Chromium	2.60E+01	mg/kg	2.60E+01	mg/kg	M	1.61E-05	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	5.4E-03
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	2.59E-02	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	8.6E-02
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	6.71E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	3.4E-02
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	6.90E-05	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	9.9E-03
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	2.36E-03	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	7.9E-03
	(Total)												1.6E-01
Dermal	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	7.27E-07	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	2.5E-03
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	1.80E-03	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	NA
	(Total)												2.5E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.6E-01

M - Medium-Specific EPC selected for hazard calculation.
NA - Not applicable
NE - Not established

303974

TABLE 7.4 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	2.05E-10	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	6.8E-06
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	8.54E-09	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	6.0E-04
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	6.0E-04

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303975

TABLE 7.5 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.32E-03	mg/kg/d	1.00E+00	mg/kg/d	NE	mg/m^3	2.3E-03
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	3.32E-07	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	1.1E-03
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	3.79E-06	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	1.3E-03
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	3.87E-03	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	1.3E-02
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	9.89E-05	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	4.9E-03
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	9.97E-06	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	1.4E-03
	(Total)												2.4E-02
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	7.94E-08	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	2.7E-04
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	NA
	(Total)												2.7E-04
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-02

M - Medium-Specific EPC selected for hazard calculation.
NA - Not applicable
NE - Not established

303976

TABLE 7.6 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Air
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	1.17E-07	mg/kg/d	1.00E-03	mg/kg/d	NE	mg/m^3	1.2E-04
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	1.91E-10	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	6.4E-06
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	4.99E-09	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	3.5E-04
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA

M - Medium-Specific EPC selected for hazard calculation.
Total Hazard Index 4.7E-04

NE - Not established
NA - Not applicable.

303977

TABLE 7.7 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment
Exposure Point: Gut System
Receptor Population: Trepasser
Receptor Age: Pre-Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	7.22E-03	mg/kg/d	1.00E+00	mg/kg/d	NE	mg/m^3	7.2E-03
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	1.03E-06	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	3.4E-03
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	1.18E-05	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	3.9E-03
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	1.20E-02	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	4.0E-02
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	3.08E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	1.5E-02
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	3.10E-05	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	4.4E-03
	(Total)												7.5E-02
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	1.73E-07	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	5.9E-04
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	NA
	(Total)												5.9E-04
												Total Hazard Index Across All Exposure Routes/Pathways	7.5E-02

M -Medium-Specific EPC selected for hazard calculation.
NA - Not applicable

303978

TABLE 7.8 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Air
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	9.18E-08	mg/kg/d	1.00E-03	mg/kg/d	NE	mg/m^3	9.2E-05
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	1.50E-10	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	5.0E-06
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	3.92E-09	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	2.7E-04
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	3.7E-04

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303979

TABLE 7.9a - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Acetone	0.187	mg/L	0.187	mg/L	M	2.19E-03	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	2.2E-02
	Chloroform	0.865	mg/L	0.865	mg/L	M	1.02E-02	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	**1.0E+00**
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	3.28E-03	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	3.3E-02
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	4.69E-04	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	7.8E-03
	Toluene	0.031	mg/L	0.031	mg/L	M	3.63E-04	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	1.8E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	1.13E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	5.6E-03
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	2.02E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	1.0E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	2.07E-04	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	1.0E-03
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	2.83E-04	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	5.7E-03
	Antimony	0.00249	mg/L	0.00249	mg/L	M	2.92E-05	mg/kg/d	4.00E-04	mg/kg/d	NE	mg/m^3	7.3E-02
	Arsenic	0.001	mg/L	0.001	mg/L	M	1.63E-05	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	5.4E-02
	Barium	0.160	mg/L	0.160	mg/L	M	1.88E-03	mg/kg/d	7.00E-02	mg/kg/d	NE	mg/m^3	2.7E-02
	Chromium	0.005	mg/L	0.005	mg/L	M	5.94E-05	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	2.0E-02
	Iron	10.1	mg/L	10.1	mg/L	M	1.19E-01	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	4.0E-01
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	1.90E-02	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	9.5E-01
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	2.94E-04	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	4.2E-02
	(Total)												**2.7E+00**
Dermal	Acetone	0.187	mg/L	0.187	mg/L	M	2.88E-05	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	2.9E-04
	Chloroform	0.865	mg/L	0.865	mg/L	M	1.99E-03	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	2.0E-01
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	5.35E-03	mg/kg/d	8.20E-02	mg/kg/d	NE	mg/m^3	6.5E-02
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	4.64E-05	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	7.7E-04
	Toluene	0.031	mg/L	0.031	mg/L	M	3.59E-04	mg/kg/d	1.60E-01	mg/kg/d	NE	mg/m^3	2.2E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	1.98E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	9.9E-03
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	6.66E-05	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	3.3E-03
	Isophorone	0.018	mg/L	0.018	mg/L	M	2.00E-05	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	1.0E-04
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	6.23E-05	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	1.2E-03
	Antimony	0.002	mg/L	0.002	mg/L	M	6.43E-07	mg/kg/d	8.00E-05	mg/kg/d	NE	mg/m^3	8.0E-03
	Arsenic	0.001	mg/L	0.001	mg/L	M	9.76E-10	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	3.3E-06
	Barium	0.160	mg/L	0.160	mg/L	M	4.13E-05	mg/kg/d	1.40E-02	mg/kg/d	NE	mg/m^3	3.0E-03
	Chromium	0.005	mg/L	0.005	mg/L	M	2.61E-06	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	4.4E-02
	Iron	10.1	mg/L	10.1	mg/L	M	2.61E-03	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	8.7E-02
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	4.17E-04	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	2.1E-01
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	6.46E-06	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	4.6E-03
	(Total)												6.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	3.3E+00

M -Medium-Specific EPC selected for hazard calculation.
NA - Not applicable

303980

TABLE 7.9b - CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Acetone	0.187	mg/L	0.187	mg/L	M	1.28E-03	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	1.3E-02
	Chloroform	0.865	mg/L	0.865	mg/L	M	5.92E-03	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	5.9E-01
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	1.92E-03	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	1.9E-02
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	2.74E-04	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	4.6E-03
	Toluene	0.031	mg/L	0.031	mg/L	M	2.12E-04	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	1.1E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	6.58E-03	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	3.3E-03
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	1.18E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	5.9E-03
	Isophorone	0.018	mg/L	0.018	mg/L	M	1.21E-04	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	6.0E-04
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	1.65E-04	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	3.3E-03
	Antimony	0.00249	mg/L	0.00249	mg/L	M	1.71E-05	mg/kg/d	4.00E-04	mg/kg/d	NE	mg/m^3	4.3E-02
	Arsenic	0.001	mg/L	0.001	mg/L	M	9.52E-06	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	3.2E-02
	Barium	0.160	mg/L	0.160	mg/L	M	1.10E-03	mg/kg/d	7.00E-02	mg/kg/d	NE	mg/m^3	1.6E-02
	Chromium	0.005	mg/L	0.005	mg/L	M	3.47E-05	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	1.2E-02
	Iron	10.1	mg/L	10.1	mg/L	M	6.92E-02	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	2.3E-01
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	1.11E-02	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	5.5E-01
	Lead	7.300	mg/L	7.300	mg/L	M	NA	NA	NE	NE	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	1.71E-04	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	2.4E-02
	(Total)												1.6E+00
Dermal	Acetone	0.187	mg/L	0.187	mg/L	M	2.75E-05	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	2.7E-04
	Chloroform	0.865	mg/L	0.865	mg/L	M	1.99E-03	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	2.0E-01
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	5.35E-03	mg/kg/d	8.20E-02	mg/kg/d	NE	mg/m^3	6.5E-02
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	4.64E-05	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	7.7E-04
	Toluene	0.031	mg/L	0.031	mg/L	M	3.59E-04	mg/kg/d	1.60E-01	mg/kg/d	NE	mg/m^3	2.2E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	1.98E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	9.9E-03
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	6.66E-05	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	3.3E-03
	Isophorone	0.018	mg/L	0.018	mg/L	M	2.00E-05	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	1.0E-04
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	6.29E-05	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	1.3E-03
	Arsenic	0.001	mg/L	0.001	mg/L	M	9.76E-10	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	3.3E-06
	Antimony	0.002	mg/L	0.002	mg/L	M	6.43E-07	mg/kg/d	8.00E-05	mg/kg/d	NE	mg/m^3	8.0E-03
	Barium	0.160	mg/L	0.160	mg/L	M	4.13E-05	mg/kg/d	1.40E-02	mg/kg/d	NE	mg/m^3	3.0E-03
	Chromium	0.005	mg/L	0.005	mg/L	M	2.61E-06	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	4.4E-02
	Iron	10.1	mg/L	10.1	mg/L	M	2.61E-03	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	8.7E-02
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	4.17E-04	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	2.1E-01
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	6.46E-06	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	4.6E-03
	(Total)												6.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.2E+00

M -Medium-Specific EPC selected for hazard calculation.
NA - Not applicable

303981

TABLE 7.10a - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^2	NA
	Chloroform	0.865	mg/L	0.865	mg/L	M	2.82E-02	mg/kg/d	8.6E-05	mg/kg/d	3.00E-04	mg/m^3	**3.3E+02**
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	9.13E-03	mg/kg/d	2.90E-01	mg/kg/d	1.00E+00	mg/m^3	3.1E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m3	NA
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.30E-03	mg/kg/d	8.60E-01	mg/kg/d	3.00E+00	mg/m^3	1.5E-03
	Toluene	0.031	mg/L	0.031	mg/L	M	1.01E-03	mg/kg/d	1.14E-01	mg/kg/d	4.00E-01	mg/m^3	8.8E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2,4-Dimethylphenol	17.20	mg/L	17.200	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2-Methylphenol	24.10	mg/L	24.100	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Antimony	2.49	mg/L	2.490	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.40	mg/L	1.400	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Barium	160	mg/L	160.000	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	5.06	mg/L	5.060	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Iron	10100	mg/L	10100.000	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Lead	7.30	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	1614	mg/L	1614.000	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	25	mg/L	25.000	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	**3.3E+02**

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303982

TABLE 7.10b - CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chloroform	0.865	mg/L	0.865	mg/L	M	2.82E-02	mg/kg/d	8.6E-05	mg/kg/d	3.00E-04	mg/m^3	**3.3E+02**
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	9.13E-03	mg/kg/d	2.90E-01	mg/kg/d	1.00E+00	mg/m^3	3.1E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.30E-03	mg/kg/d	8.60E-01	mg/kg/d	3.00E+00	mg/m^3	1.5E-03
	Toluene	0.031	mg/L	0.031	mg/L	M	1.01E-03	mg/kg/d	1.14E-01	mg/kg/d	4.00E-01	mg/m^3	8.8E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2,4-Dimethylphenol	17.20	mg/L	17.200	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
Inhalation	2-Methylphenol	24.10	mg/L	24.100	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Antimony	2.49	mg/L	2.490	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.40	mg/L	1.400	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Barium	160	mg/L	160.000	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	5.06	mg/L	5.060	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Iron	10100	mg/L	10100.000	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Lead	7.30	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	1614	mg/L	1614.000	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	25	mg/L	25.000	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	**3.3E+02**

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303983

TABLE 7.11 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	3.34E-06	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	1.1E-02
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	1.25E-05	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	4.2E-03
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	2.00E-02	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	6.7E-02
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	5.18E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	2.6E-02
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	5.33E-05	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	7.6E-03
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	1.83E-03	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	6.1E-03
	(Total)												1.2E-01
Dermal	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	1.32E-06	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	4.5E-03
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	NA
	(Total)												4.5E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E-01

M -Medium-Specific EPC selected for hazard calculation.
NA - Not applicable

303984

TABLE 7.12 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	1.26E-09	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	4.2E-05
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	5.24E-08	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	3.7E-03
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	3.7E-03

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303985

TABLE 7.13 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment
Exposure Point: Gut System
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	5.58E-03	mg/kg/d	1.00E+00	mg/kg/d	NE	mg/m^3	5.6E-03
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	7.97E-07	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	2.7E-03
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	9.10E-06	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	3.0E-03
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	9.30E-03	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	3.1E-02
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	2.38E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	1.2E-02
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	2.40E-05	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	3.4E-03
	(Total)												5.8E-02
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	3.16E-07	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	1.1E-03
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	NA
	(Total)												1.1E-03
												Total Hazard Index Across All Exposure Routes/Pathways	5.9E-02

M -Medium-Specific EPC selected for hazard calculation.
NA - Not applicable
NE - Not established

303986

TABLE 7.14 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Air
Exposure Point: Gut System
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	5.63E-07	mg/kg/d	1.00E-03	mg/kg/d	NE	mg/m^3	5.6E-04
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	9.19E-10	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	3.1E-05
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	2.40E-08	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	1.7E-03
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	2.3E-03

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303987

TABLE 7.15a - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	3.21E-05	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	1.1E-01
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	1.20E-04	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	4.0E-02
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	1.92E-01	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	6.4E-01
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	4.98E-03	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	2.5E-01
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	5.12E-04	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	7.3E-02
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	1.75E-02	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	5.8E-02
	(Total)												**1.2E+00**
Dermal	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	1.32E-06	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	4.5E-03
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	NA
	(Total)												4.5E-03
												Total Hazard Index Across All Exposure Routes/Pathways	**1.2E+00**

M -Medium-Specific EPC selected for hazard calculation.
NA - Not applicable
NE - Not established

303988

TABLE 7.15b - CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	6.68E-06	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	2.2E-02
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	2.50E-05	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	8.3E-03
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	4.00E-02	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	1.3E-01
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	1.04E-03	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	5.2E-02
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	1.07E-04	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	1.5E-02
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	3.65E-03	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	1.2E-02
	(Total)												2.4E-01
Dermal	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	1.32E-07	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	4.5E-04
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	NA
	(Total)												4.5E-04
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-01

M -Medium-Specific EPC selected for hazard calculation.
NA - Not applicable
NE - Not established

303989

TABLE 7.16a - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	5.29E-09	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	1.8E-04
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	2.20E-07	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	1.5E-02
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	1.6E-02

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303990

TABLE 7.16b - CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Arsenic	6.83E+00	mg/kg	6.83E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	1.97E-09	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	6.6E-05
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	8.17E-08	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	5.7E-03
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	5.8E-03

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303991

TABLE 7.17 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment
Exposure Point: Gut System
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	5.35E-02	mg/kg/d	1.00E+00	mg/kg/d	NE	mg/m^3	5.4E-02
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	7.66E-06	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	2.6E-02
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	8.74E-05	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	2.9E-02
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	8.92E-02	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	3.0E-01
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	2.28E-03	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	1.1E-01
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	2.30E-04	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	3.3E-02
	(Total)												5.5E-01
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	3.16E-07	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	1.1E-03
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	NA
	(Total)												1.1E-03
												Total Hazard Index Across All Exposure Routes/Pathways	5.5E-01

M -Medium-Specific EPC selected for hazard calculation.
NA - Not applicable

303992

TABLE 7.18 - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Air
Exposure Point: Gut System
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	2.37E-06	mg/kg/d	1.00E-03	mg/kg/d	NE	mg/m^3	2.4E-03
	Arsenic	1.63E+00	mg/kg	1.63E+00	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	3.86E-09	mg/kg/d	3.00E-05	mg/kg/d	2.85E-05	mg/m^3	1.3E-04
	Iron	1.90E+03	mg/kg	1.90E+03	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	1.01E-07	mg/kg/d	1.43E-05	mg/kg/d	5.00E-05	mg/m^3	7.1E-03
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	9.5E-03

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable.

303993

TABLE 7.19a - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Acetone	0.187	mg/L	0.187	mg/L	M	6.15E-03	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	6.1E-02
	Chloroform	0.865	mg/L	0.865	mg/L	M	2.84E-02	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	**2.8E+00**
	Dimethylphenol, 2,4-	0.017	mg/L	0.017	mg/L	M	5.65E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	2.8E-02
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	9.21E-03	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	9.2E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	5.79E-04	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	2.9E-03
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.32E-03	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	2.2E-02
	Methylphenol, 2-	0.024	mg/L	0.024	mg/L	M	7.92E-04	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	1.6E-02
	Toluene	0.031	mg/L	0.031	mg/L	M	1.02E-03	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	5.1E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	3.16E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	1.6E-02
	Antimony	0.00249	mg/L	0.00249	mg/L	M	8.19E-05	mg/kg/d	4.00E-04	mg/kg/d	NE	mg/m^3	2.0E-01
	Arsenic	0.001	mg/L	0.001	mg/L	M	4.60E-05	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	1.5E-01
	Barium	0.160	mg/L	0.160	mg/L	M	5.26E-03	mg/kg/d	7.00E-02	mg/kg/d	NE	mg/m^3	7.5E-02
	Chromium	0.005	mg/L	0.005	mg/L	M	1.66E-04	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	5.5E-02
	Iron	10.1	mg/L	10.1	mg/L	M	3.32E-01	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	**1.1E+00**
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	5.31E-02	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	**2.7E+00**
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	8.22E-04	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	1.2E-01
	(Total)												7.5E+00
Dermal	Acetone	0.187	mg/L	0.187	mg/L	M	1.40E-05	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	1.4E-04
(shower)	Chloroform	0.865	mg/L	0.865	mg/L	M	1.01E-03	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	1.0E-01
	Dimethylphenol, 2,4-	0.017	mg/L	0.017	mg/L	M	3.40E-05	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	1.7E-03
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	2.73E-03	mg/kg/d	8.20E-02	mg/kg/d	NE	mg/m^3	3.3E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	1.02E-05	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	5.1E-05
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	2.37E-05	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	4.0E-04
	Methylphenol, 2-	0.024	mg/L	0.024	mg/L	M	3.18E-05	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	6.4E-04
	Toluene	0.031	mg/L	0.031	mg/L	M	1.83E-04	mg/kg/d	1.60E-01	mg/kg/d	NE	mg/m^3	1.1E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	1.01E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	5.1E-03
	Antimony	0.002	mg/L	0.002	mg/L	M	3.28E-07	mg/kg/d	8.00E-05	mg/kg/d	NE	mg/m^3	4.1E-03
	Arsenic	0.001	mg/L	0.001	mg/L	M	4.98E-10	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	1.7E-06
	Barium	0.160	mg/L	0.160	mg/L	M	2.11E-05	mg/kg/d	1.40E-02	mg/kg/d	NE	mg/m^3	1.5E-03
	Chromium	0.005	mg/L	0.005	mg/L	M	1.33E-06	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	2.2E-02
	Iron	10.1	mg/L	10.1	mg/L	M	1.33E-03	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	4.4E-02
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	2.13E-04	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	1.1E-01
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	3.29E-06	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	2.4E-03
	(Total)												3.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	**7.8E+00**

M - Medium-Specific EPC selected for hazard calculation.
NA - Not applicable

TABLE 7.19b - CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Acetone	0.187	mg/L	0.187	mg/L	M	3.59E-03	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	3.6E-02
	Chloroform	0.865	mg/L	0.865	mg/L	M	1.66E-02	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	1.7E+00
	Dimethylphenol, 2,4-	0.017	mg/L	0.017	mg/L	M	3.30E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	1.6E-02
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	5.37E-03	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	5.4E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	3.38E-04	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	1.7E-03
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	7.67E-04	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	1.3E-02
	Methylphenol, 2-	0.024	mg/L	0.024	mg/L	M	4.62E-04	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	9.2E-03
	Toluene	0.031	mg/L	0.031	mg/L	M	5.93E-04	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	3.0E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	1.84E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	9.2E-03
	Antimony	0.00249	mg/L	0.00249	mg/L	M	4.78E-05	mg/kg/d	4.00E-04	mg/kg/d	NE	mg/m^3	1.2E-01
	Arsenic	0.001	mg/L	0.001	mg/L	M	2.68E-05	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	8.9E-02
	Barium	0.160	mg/L	0.160	mg/L	M	3.07E-03	mg/kg/d	7.00E-02	mg/kg/d	NE	mg/m^3	4.4E-02
	Chromium	0.005	mg/L	0.005	mg/L	M	9.70E-05	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	3.2E-02
	Iron	10.1	mg/L	10.1	mg/L	M	1.94E-01	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	6.5E-01
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	3.10E-02	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	1.5E+00
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	4.79E-04	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	6.8E-02
	(Total)												4.3E+00
Dermal (shower)	Acetone	0.187	mg/L	0.187	mg/L	M	4.41E-06	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	4.4E-05
	Chloroform	0.865	mg/L	0.865	mg/L	M	3.19E-04	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	3.2E-02
	Dimethylphenol, 2,4-	0.017	mg/L	0.017	mg/L	M	1.07E-05	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	5.3E-04
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	8.59E-04	mg/kg/d	8.20E-02	mg/kg/d	NE	mg/m^3	1.0E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	3.21E-06	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	1.6E-05
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	7.46E-06	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	1.2E-04
	Methylphenol, 2-	0.024	mg/L	0.024	mg/L	M	9.99E-06	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	2.0E-04
	Toluene	0.031	mg/L	0.031	mg/L	M	5.76E-05	mg/kg/d	1.60E-01	mg/kg/d	NE	mg/m^3	3.6E-04
	Xylenes	0.960	mg/L	0.960	mg/L	M	3.18E-03	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	1.6E-03
	Antimony	0.002	mg/L	0.002	mg/L	M	1.03E-07	mg/kg/d	8.00E-05	mg/kg/d	NE	mg/m^3	1.3E-03
	Arsenic	0.001	mg/L	0.001	mg/L	M	1.57E-10	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	5.3E-07
	Barium	0.160	mg/L	0.160	mg/L	M	6.63E-06	mg/kg/d	1.40E-02	mg/kg/d	NE	mg/m^3	4.7E-04
	Chromium	0.005	mg/L	0.005	mg/L	M	4.19E-07	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	7.0E-03
	Iron	10.1	mg/L	10.1	mg/L	M	4.19E-04	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	1.4E-02
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	6.69E-05	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	3.3E-02
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	1.04E-06	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	7.4E-04
	(Total)												1.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.4E+00

M -Medium-Specific EPC selected for hazard calculation
NA - Not applicable

303995

TABLE 7.20a - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
	Acetone	0.187	mg/L	0.759	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
Inhalation	Chloroform	0.865	mg/L	3.509	mg/m^3	R	2.12E-02	mg/kg/d	8.60E-05	mg/kg/d	3.00E-04	mg/m^3	**2.5E+02**
(shower)	Ethylbenzene	0.280	mg/L	1.136	mg/m^3	R	6.87E-03	mg/kg/d	2.90E-01	mg/kg/d	1.00E+00	mg/m^3	2.4E-02
	Isophorone	0.018	mg/L	0.071	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Methylene chloride	0.040	mg/L	0.162	mg/m^3	R	9.81E-04	mg/kg/d	8.60E-01	mg/kg/d	3.00E+00	mg/m^3	1.1E-03
	Toluene	0.031	mg/L	0.125	mg/m^3	R	7.58E-04	mg/kg/d	1.14E-01	mg/kg/d	4.00E-01	mg/m^3	6.6E-03
	Xylenes	0.960	mg/L	3.894	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2,4-Dimethylphenol	17.20	mg/L	0.070	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2-Methylphenol	24.10	mg/L	0.098	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Antimony	2.49	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.40	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Barium	160	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	5.06	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Iron	10100	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Lead	7.30	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	1614	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	25	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	**2.5E+02**

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable

303996

TABLE 7.20b - CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
	Acetone	0.187	mg/L	0.759	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
Inhalation	Chloroform	0.865	mg/L	3.509	mg/m^3	R	6.67E-03	mg/kg/d	8.60E-05	mg/kg/d	3.00E-04	mg/m^3	**7.8E+01**
(shower)	Ethylbenzene	0.280	mg/L	1.136	mg/m^3	R	2.16E-03	mg/kg/d	2.90E-01	mg/kg/d	1.00E+00	mg/m^3	7.4E-03
	Isophorone	0.018	mg/L	0.071	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Methylene chloride	0.040	mg/L	0.162	mg/m^3	R	3.09E-04	mg/kg/d	8.60E-01	mg/kg/d	3.00E+00	mg/m^3	3.6E-04
	Toluene	0.031	mg/L	0.125	mg/m^3	R	2.38E-04	mg/kg/d	1.14E-01	mg/kg/d	4.00E-01	mg/m^3	2.1E-03
	Xylenes	0.960	mg/L	3.894	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2,4-Dimethylphenol	17.20	mg/L	0.070	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2-Methylphenol	24.10	mg/L	0.098	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Antimony	2.49	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.40	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Barium	160	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	5.06	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Iron	10100	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Lead	7.30	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	1614	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	25	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	**7.8E+01**

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable

303997

TABLE 7.21a - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Acetone	0.187	mg/L	0.187	mg/L	M	1.79E-02	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	1.8E-01
	Chloroform	0.865	mg/L	0.865	mg/L	M	8.29E-02	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	**8.3E+00**
	Dimethylphenol, 2,4-	0.017	mg/L	0.017	mg/L	M	1.65E-03	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	8.2E-02
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	2.68E-02	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	2.7E-01
	Isophorone	0.018	mg/L	0.018	mg/L	M	1.69E-03	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	8.4E-03
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	3.84E-03	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	6.4E-02
	Methylphenol, 2-	0.024	mg/L	0.024	mg/L	M	2.31E-03	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	4.6E-02
	Toluene	0.031	mg/L	0.031	mg/L	M	2.96E-03	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	1.5E-02
	Xylenes	0.960	mg/L	0.960	mg/L	M	9.21E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	4.6E-02
	Antimony	0.00249	mg/L	0.00249	mg/L	M	2.39E-04	mg/kg/d	4.00E-04	mg/kg/d	NE	mg/m^3	6.0E-01
	Arsenic	0.001	mg/L	0.001	mg/L	M	1.34E-04	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	4.5E-01
	Barium	0.160	mg/L	0.160	mg/L	M	1.53E-02	mg/kg/d	7.00E-02	mg/kg/d	NE	mg/m^3	2.2E-01
	Chromium	0.005	mg/L	0.005	mg/L	M	4.85E-04	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	1.6E-01
	Iron	10.1	mg/L	10.1	mg/L	M	9.68E-01	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	**3.2E+00**
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	1.55E-01	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	**7.7E+00**
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	2.40E-03	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	3.4E-01
	(Total)												**2.2E+01**
Dermal (shower)	Acetone	0.187	mg/L	0.187	mg/L	M	2.59E-05	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	2.6E-04
	Chloroform	0.865	mg/L	0.865	mg/L	M	1.88E-03	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	1.9E-01
	Dimethylphenol, 2,4-	0.017	mg/L	0.017	mg/L	M	6.29E-05	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	3.1E-03
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	5.05E-03	mg/kg/d	8.20E-02	mg/kg/d	NE	mg/m^3	6.2E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	1.89E-05	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	9.4E-05
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	4.39E-05	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	7.3E-04
	Methylphenol, 2-	0.024	mg/L	0.024	mg/L	M	5.87E-05	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	1.2E-03
	Toluene	0.031	mg/L	0.031	mg/L	M	3.39E-04	mg/kg/d	1.60E-01	mg/kg/d	NE	mg/m^3	2.1E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	1.87E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	9.4E-03
	Antimony	0.002	mg/L	0.002	mg/L	M	6.07E-07	mg/kg/d	8.00E-05	mg/kg/d	NE	mg/m^3	7.6E-03
	Arsenic	0.001	mg/L	0.001	mg/L	M	9.21E-10	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	3.1E-06
	Barium	0.160	mg/L	0.160	mg/L	M	3.90E-05	mg/kg/d	1.40E-02	mg/kg/d	NE	mg/m^3	2.8E-03
	Chromium	0.005	mg/L	0.005	mg/L	M	2.47E-06	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	4.1E-02
	Iron	10.1	mg/L	10.1	mg/L	M	2.46E-03	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	8.2E-02
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	3.93E-04	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	2.0E-01
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	6.09E-06	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	4.4E-03
	(Total)												6.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	**2.2E+01**

M -Medium-Specific EPC selected for hazard calculation
NA - Not applicable

303998

TABLE 7.21b - CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Acetone	0.187	mg/L	0.187	mg/L	M	1.04E-02	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	1.0E-01
	Chloroform	0.865	mg/L	0.865	mg/L	M	4.81E-02	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	**4.8E+00**
	Dimethylphenol, 2,4-	0.017	mg/L	0.017	mg/L	M	9.57E-04	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	4.8E-02
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	1.56E-02	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	1.6E-01
	Isophorone	0.018	mg/L	0.018	mg/L	M	9.79E-04	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	4.9E-03
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	2.22E-03	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	3.7E-02
	Methylphenol, 2-	0.024	mg/L	0.024	mg/L	M	1.34E-03	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	2.7E-02
	Toluene	0.031	mg/L	0.031	mg/L	M	1.72E-03	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	8.6E-03
	Xylenes	0.960	mg/L	0.960	mg/L	M	5.34E-02	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	2.7E-02
	Antimony	0.00249	mg/L	0.00249	mg/L	M	1.38E-04	mg/kg/d	4.00E-04	mg/kg/d	NE	mg/m^3	3.5E-01
	Arsenic	0.001	mg/L	0.001	mg/L	M	7.79E-05	mg/kg/d	3.00E-04	mg/kg/d	NE	mg/m^3	2.6E-01
	Barium	0.160	mg/L	0.160	mg/L	M	8.90E-03	mg/kg/d	7.00E-02	mg/kg/d	NE	mg/m^3	1.3E-01
	Chromium	0.005	mg/L	0.005	mg/L	M	2.81E-04	mg/kg/d	3.00E-03	mg/kg/d	NE	mg/m^3	9.4E-02
	Iron	10.1	mg/L	10.1	mg/L	M	5.62E-01	mg/kg/d	3.00E-01	mg/kg/d	NE	mg/m^3	**1.9E+00**
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	8.98E-02	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	**4.5E+00**
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	1.39E-03	mg/kg/d	7.00E-03	mg/kg/d	NE	mg/m^3	2.0E-01
	(Total)												**1.3E+01**
Dermal (bath)	Acetone	0.187	mg/L	0.187	mg/L	M	8.16E-06	mg/kg/d	1.00E-01	mg/kg/d	NE	mg/m^3	8.2E-05
	Chloroform	0.865	mg/L	0.865	mg/L	M	5.90E-04	mg/kg/d	1.00E-02	mg/kg/d	NE	mg/m^3	5.9E-02
	Dimethylphenol, 2,4-	0.017	mg/L	0.017	mg/L	M	1.98E-05	mg/kg/d	2.00E-02	mg/kg/d	NE	mg/m^3	9.9E-04
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	1.59E-03	mg/kg/d	8.20E-02	mg/kg/d	NE	mg/m^3	1.9E-02
	Isophorone	0.018	mg/L	0.018	mg/L	M	5.94E-06	mg/kg/d	2.00E-01	mg/kg/d	NE	mg/m^3	3.0E-05
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.38E-05	mg/kg/d	6.00E-02	mg/kg/d	NE	mg/m^3	2.3E-04
	Methylphenol, 2-	0.024	mg/L	0.024	mg/L	M	1.85E-05	mg/kg/d	5.00E-02	mg/kg/d	NE	mg/m^3	3.7E-04
	Toluene	0.031	mg/L	0.031	mg/L	M	1.07E-04	mg/kg/d	1.60E-01	mg/kg/d	NE	mg/m^3	6.7E-04
	Xylenes	0.960	mg/L	0.960	mg/L	M	5.89E-03	mg/kg/d	2.00E+00	mg/kg/d	NE	mg/m^3	2.9E-03
	Antimony	0.002	mg/L	0.002	mg/L	M	1.91E-07	mg/kg/d	8.00E-05	mg/kg/d	NE	mg/m^3	2.4E-03
	Arsenic	0.001	mg/L	0.001	mg/L	M	2.90E-10	mg/kg/d	2.94E-04	mg/kg/d	NE	mg/m^3	9.9E-07
	Barium	0.160	mg/L	0.160	mg/L	M	1.23E-05	mg/kg/d	1.40E-02	mg/kg/d	NE	mg/m^3	8.8E-04
	Chromium	0.005	mg/L	0.005	mg/L	M	7.76E-07	mg/kg/d	6.00E-05	mg/kg/d	NE	mg/m^3	1.3E-02
	Iron	10.1	mg/L	10.1	mg/L	M	7.74E-04	mg/kg/d	3.00E-02	mg/kg/d	NE	mg/m^3	2.6E-02
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	1.24E-04	mg/kg/d	2.00E-03	mg/kg/d	NE	mg/m^3	6.2E-02
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	1.92E-06	mg/kg/d	1.40E-03	mg/kg/d	NE	mg/m^3	1.4E-03
	(Total)												1.9E-01
											Total Hazard Index Across All Exposure Routes/Pathways		**1.3E+01**

M -Medium-Specific EPC selected for hazard calculation
NA - Not applicable

303999

TABLE 7.22a - RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
	Acetone	0.187	mg/L	0.759	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
Inhalation	Chloroform	0.865	mg/L	3.509	mg/m^3	R	4.99E-02	mg/kg/d	8.60E-05	mg/kg/d	3.00E-04	mg/m^3	**5.8E+02**
(bath)	Ethylbenzene	0.280	mg/L	1.136	mg/m^3	R	1.62E-02	mg/kg/d	2.90E-01	mg/kg/d	1.00E+00	mg/m^3	5.6E-02
	Isophorone	0.018	mg/L	0.071	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Methylene chloride	0.040	mg/L	0.162	mg/m^3	R	2.31E-03	mg/kg/d	8.60E-01	mg/kg/d	3.00E+00	mg/m^3	2.7E-03
	Toluene	0.031	mg/L	0.125	mg/m^3	R	1.78E-03	mg/kg/d	1.14E-01	mg/kg/d	4.00E-01	mg/m^3	1.6E-02
	Xylenes	0.960	mg/L	3.894	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2,4-Dimethylphenol	17.20	mg/L	0.070	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2-Methylphenol	24.10	mg/L	0.098	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Antimony	2.49	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.40	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Barium	160	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	5.06	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Iron	10100	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Lead	7.30	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	1614	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	25	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	**5.8E+02**

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable

TABLE 7.22b - CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
	Acetone	0.187	mg/L	0.759	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
Inhalation	Chloroform	0.865	mg/L	3.509	mg/m^3	R	1.57E-02	mg/kg/d	8.60E-05	mg/kg/d	3.00E-04	mg/m^3	**1.8E+02**
(shower)	Ethylbenzene	0.280	mg/L	1.136	mg/m^3	R	5.08E-03	mg/kg/d	2.90E-01	mg/kg/d	1.00E+00	mg/m^3	1.8E-02
	Isophorone	0.018	mg/L	0.071	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Methylene chloride	0.040	mg/L	0.162	mg/m^3	R	7.26E-04	mg/kg/d	8.60E-01	mg/kg/d	3.00E+00	mg/m^3	8.4E-04
	Toluene	0.031	mg/L	0.125	mg/m^3	R	5.61E-04	mg/kg/d	1.14E-01	mg/kg/d	4.00E-01	mg/m^3	4.9E-03
	Xylenes	0.960	mg/L	3.894	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2,4-Dimethylphenol	17.20	mg/L	0.070	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	2-Methylphenol	24.10	mg/L	0.098	mg/m^3	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Antimony	2.49	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Arsenic	1.40	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Barium	160	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Chromium	5.06	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Iron	10100	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Lead	7.30	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Manganese	1614	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
	Vanadium	25	mg/L	NA	NA	R	NA	mg/kg/d	NE	mg/kg/d	NE	mg/m^3	NA
												Total Hazard Index	**1.8E+02**

M -Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not applicable

304001

TABLE 8.1a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.830	mg/kg	6.830	mg/kg	M	5.96E-07	mg/kg/d	1.50E+00	1/mg/kg/d	9E-07
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.43E-07	mg/kg/d	1.47E+00	1/mg/kg/d	2E-07
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	**1E-06**

304002

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

TABLE 8.1b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.830	mg/kg	6.830	mg/kg	M	8.94E-08	mg/kg/d	1.50E+00	1/mg/kg/d	1E-07
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Arsenic	6.830	mg/kg	6.830	mg/kg	M	3.06E-09	mg/kg/d	1.47E+00	1/mg/kg/d	4E-09
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	1E-07

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304003

TABLE 8.2a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Arsenic	6.830	mg/kg	6.830	mg/kg	M	3.01E-11	mg/kg/d	1.51E+01	1/mg/kg/d	5E-10
	Chromium	25.5	mg/kg	25.5	mg/kg	M	1.12E-10	mg/kg/d	4.20E+01	1/mg/kg/d	5E-09
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
											5E-09

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304004

TABLE 8.2b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Arsenic	6.830	mg/kg	6.830	mg/kg	M	2.26E-12	mg/kg/d	1.51E+01	1/mg/kg/d	3E-11
	Chromium	25.5	mg/kg	25.5	mg/kg	M	8.42E-12	mg/kg/d	4.20E+01	1/mg/kg/d	4E-10
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
											4E-10

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304005

TABLE 8.3 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.830	mg/kg	6.830	mg/kg	M	3.09E-07	mg/kg/d	1.50E+00	1/mg/kg/d	5E-07
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Arsenic	6.830	mg/kg	6.830	mg/kg	M	5.19E-08	mg/kg/d	1.47E+00	1/mg/kg/d	8E-08
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	5E-07

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304006

TABLE 8.4 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Arsenic	6.830	mg/kg	6.830	mg/kg	M	3.93E-12	mg/kg/d	1.51E+01	1/mg/kg/d	6E-11
	Chromium	25.5	mg/kg	25.5	mg/kg	M	1.47E-11	mg/kg/d	4.20E+01	1/mg/kg/d	6E-10
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	7E-10

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304007

TABLE 8.5 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/ Sediment
Exposure Medium: Soil/Sediment
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.42E-07	mg/kg/d	1.50E+00	1/mg/kg/d	2E-07
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	3.40E-08	mg/kg/d	1.47E+00	1/mg/kg/d	5E-08
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
									Total Cancer Risk		3E-07

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304008

TABLE 8.6 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Air
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	7.18E-12	mg/kg/d	1.51E+01	1/mg/kg/d	1E-10
	Chromium	18.6	mg/kg	18.6	mg/kg	M	8.19E-11	mg/kg/d	4.20E+01	1/mg/kg/d	3E-09
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	4E-09

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304009

TABLE 8.7 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	7.37E-08	mg/kg/d	1.50E+00	1/mg/kg/d	1E-07
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.24E-08	mg/kg/d	1.47E+00	1/mg/kg/d	2E-08
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	1E-07

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304010

TABLE 8.8 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Air
Exposure Point: Gut System
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	9.38E-13	mg/kg/d	1.51E+01	1/mg/kg/d	1E-11
	Chromium	18.6	mg/kg	18.6	mg/kg	M	1.07E-11	mg/kg/d	4.20E+01	1/mg/kg/d	4E-10
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
											5E-10

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304011

TABLE 8.9a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Chloroform	0.865	mg/L	0.865	mg/L	M	3.63E-03	mg/kg/d	6.10E-03	1/mg/kg/d	2E-05
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.68E-04	mg/kg/d	7.50E-03	1/mg/kg/d	1E-06
	Isophorone	0.018	mg/L	0.018	mg/L	M	7.39E-05	mg/kg/d	9.50E-04	1/mg/kg/d	7E-08
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	5.83E-06	mg/kg/d	1.50E+00	1/mg/kg/d	9E-06
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										3E-05
Dermal	Chloroform	0.865	mg/L	0.865	mg/L	M	7.10E-04	mg/kg/d	6.10E-03	1/mg/kg/d	4E-06
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.66E-05	mg/kg/d	7.50E-03	1/mg/kg/d	1E-07
	Isophorone	0.018	mg/L	0.018	mg/L	M	7.15E-06	mg/kg/d	9.50E-04	1/mg/kg/d	7E-09
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	2.49E-10	mg/kg/d	1.47E+00	1/mg/kg/d	4E-10
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										4E-06
									Total Cancer Risk		4E-05

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304012

TABLE 8.9b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Chloroform	0.865	mg/L	0.865	mg/L	M	5.58E-04	mg/kg/d	6.10E-03	1/mg/kg/d	3E-06
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	2.58E-05	mg/kg/d	7.50E-03	1/mg/kg/d	2E-07
	Isophorone	0.018	mg/L	0.018	mg/L	M	1.14E-05	mg/kg/d	9.50E-04	1/mg/kg/d	1E-08
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	8.98E-07	mg/kg/d	1.50E+00	1/mg/kg/d	1E-06
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										5E-06
Dermal	Chloroform	0.865	mg/L	0.865	mg/L	M	1.87E-04	mg/kg/d	6.10E-03	1/mg/kg/d	1E-06
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	4.38E-06	mg/kg/d	7.50E-03	1/mg/kg/d	3E-08
	Isophorone	0.018	mg/L	0.018	mg/L	M	1.89E-06	mg/kg/d	9.50E-04	1/mg/kg/d	2E-09
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	6.58E-11	mg/kg/d	1.47E+00	1/mg/kg/d	1E-10
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										1E-06
									Total Cancer Risk		6E-06

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304013

TABLE 8.10a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Chloroform	0.865	mg/L	0.865	mg/L	M	1.01E-02	mg/kg/d	8.10E-02	1/mg/kg/d	**8E-04**
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	4.65E-04	mg/kg/d	1.65E-03	1/mg/kg/d	8E-07
	Isophorone	0.018	mg/L	0.018	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	NA	mg/kg/d	NA	1/mg/kg/d	NA
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NA	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	**8E-04**

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304014

TABLE 8.10b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Local Aquifers (Alluvium & Kingshill)
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Chloroform	0.865	mg/L	0.865	mg/L	M	2.66E-03	mg/kg/d	8.10E-02	1/mg/kg/d	**2E-04**
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.23E-04	mg/kg/d	1.65E-03	1/mg/kg/d	2E-07
	Isophorone	0.018	mg/L	0.018	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	**2E-04**

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304015

TABLE 8.11a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.19E-06	mg/kg/d	1.50E+00	1/mg/kg/d	**2E-06**
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Arsenic	6.830	mg/kg	6.830	mg/kg	M	4.73E-07	mg/kg/d	1.47E+00	1/mg/kg/d	7E-07
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
									Total Cancer Risk		**2E-06**

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304016

TABLE 8.11b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.830	mg/kg	6.830	mg/kg	M	3.15E-07	mg/kg/d	1.50E+00	1/mg/kg/d	5E-07
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.25E-08	mg/kg/d	1.47E+00	1/mg/kg/d	2E-08
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	5E-07

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304017

TABLE 8.12 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.20E-10	mg/kg/d	1.51E+01	1/mg/kg/d	2E-09
	Chromium	25.5	mg/kg	25.5	mg/kg	M	4.50E-10	mg/kg/d	4.20E+01	1/mg/kg/d	2E-08
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	2E-08

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304018

TABLE 8.13 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment
Exposure Point: Gut System
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	2.85E-07	mg/kg/d	1.50E+00	1/mg/kg/d	4E-07
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.13E-07	mg/kg/d	1.47E+00	1/mg/kg/d	2E-07
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
									Total Cancer Risk		6E-07

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304019

TABLE 8.14 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Air
Exposure Point: Gut System
Receptor Population: Industrial/Commercial
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	2.88E-11	mg/kg/d	1.51E+01	1/mg/kg/d	4E-10
	Chromium	18.600	mg/kg	18.600	mg/kg	M	3.28E-10	mg/kg/d	4.20E+01	1/mg/kg/d	1E-08
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	1E-08

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304020

TABLE 8.15 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

ScenarioTimeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: VICHEM Site
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.830	mg/kg	6.830	mg/kg	M	4.58E-07	mg/kg/d	1.50E+00	1/mg/kg/d	7E-07
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.89E-08	mg/kg/d	1.47E+00	1/mg/kg/d	3E-08
	Chromium	2.55E+01	mg/kg	2.55E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	7E-07

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304021

TABLE 8.16 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: VICHEM Site
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Arsenic	6.830	mg/kg	6.830	mg/kg	M	2.03E-11	mg/kg/d	1.51E+01	1/mg/kg/d	3E-10
	Chromium	25.500	mg/kg	25.500	mg/kg	M	7.56E-11	mg/kg/d	4.20E+01	1/mg/kg/d	3E-09
	Iron	4.09E+04	mg/kg	4.09E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.06E+03	mg/kg	1.06E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	1.09E+02	mg/kg	1.09E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Zinc	3.73E+03	mg/kg	3.73E+03	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	3E-09

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304022

TABLE 8.17 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment
Exposure Point: Gut System
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	1.09E-07	mg/kg/d	1.50E+00	1/mg/kg/d	2E-07
	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
Dermal	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	4.51E-09	mg/kg/d	1.47E+00	1/mg/kg/d	7E-09
	Chromium	1.86E+01	mg/kg	1.86E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
									Total Cancer Risk		2E-07

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304023

TABLE 8.18 - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Soil/Sediment
Exposure Medium: Air
Exposure Point: Gut System
Receptor Population: Construction
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Aluminum	1.14E+04	mg/kg	1.14E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	6.830	mg/kg	6.830	mg/kg	M	4.83E-12	mg/kg/d	1.51E+01	1/mg/kg/d	7E-11
	Chromium	18.600	mg/kg	18.600	mg/kg	M	5.52E-11	mg/kg/d	4.20E+01	1/mg/kg/d	2E-09
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese	4.86E+02	mg/kg	4.86E+02	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	4.90E+01	mg/kg	4.90E+01	mg/kg	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
									Total Cancer Risk		2E-09

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304024

TABLE 8.19a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Chloroform	0.865	mg/L	0.865	mg/L	M	1.22E-02	mg/kg/d	6.10E-03	1/mg/kg/d	7E-05
	Isophorone	0.018	mg/L	0.018	mg/L	M	2.48E-04	mg/kg/d	9.50E-04	1/mg/kg/d	2E-07
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	5.64E-04	mg/kg/d	7.50E-03	1/mg/kg/d	4E-06
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	1.97E-05	mg/kg/d	1.50E+00	1/mg/kg/d	3E-05
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										1E-04
Dermal	Chloroform	0.865	mg/L	0.865	mg/L	M	4.35E-04	mg/kg/d	6.10E-03	1/mg/kg/d	3E-06
	Methylene chloride	0.018	mg/L	0.018	mg/L	M	1.02E-05	mg/kg/d	7.50E-03	1/mg/kg/d	8E-08
	Isophorone	0.040	mg/L	0.040	mg/L	M	4.37E-06	mg/kg/d	9.50E-04	1/mg/kg/d	4E-09
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	2.13E-10	mg/kg/d	1.47E+00	1/mg/kg/d	3E-10
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										3E-06
									Total Cancer Risk		1E-04

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304025

TABLE 8.19b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Chloroform	0.865	mg/L	0.865	mg/L	M	2.13E-03	mg/kg/d	6.10E-03	1/mg/kg/d	1E-05
	Isophorone	0.018	mg/L	0.018	mg/L	M	4.34E-05	mg/kg/d	9.50E-04	1/mg/kg/d	4E-08
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	9.86E-05	mg/kg/d	7.50E-03	1/mg/kg/d	7E-07
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	3.45E-06	mg/kg/d	1.50E+00	1/mg/kg/d	5E-06
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										2E-05
Dermal	Chloroform	0.865	mg/L	0.865	mg/L	M	4.10E-05	mg/kg/d	6.10E-03	1/mg/kg/d	3E-07
	Isophorone	0.018	mg/L	0.018	mg/L	M	4.13E-07	mg/kg/d	9.50E-04	1/mg/kg/d	4E-10
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	9.59E-07	mg/kg/d	7.50E-03	1/mg/kg/d	7E-09
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	2.01E-11	mg/kg/d	1.47E+00	1/mg/kg/d	3E-11
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	0.025	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										3E-07
								Total Cancer Risk			2E-05

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304026

TABLE 8.20a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Chloroform	0.865	mg/L	3.590	mg/m^3	R	9.09E-03	mg/kg/d	8.10E-02	1/mg/kg/d	**7E-04**
	Methylene chloride	0.040	mg/L	0.162	mg/m^3	R	4.21E-04	mg/kg/d	1.65E-03	1/mg/kg/d	7E-07
	Isophorone	0.018	mg/L	0.071	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Acetone	0.187	mg/L	0.759	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	1.136	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.125	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	3.894	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.070	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.098	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Antimony	0.00249	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	**7E-04**

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304027

TABLE 8.20b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Chloroform	0.865	mg/L	3.590	mg/m^3	R	8.58E-04	mg/kg/d	8.10E-02	1/mg/kg/d	**7E-05**
	Methylene chloride	0.040	mg/L	0.162	mg/m^3	R	3.97E-05	mg/kg/d	1.65E-03	1/mg/kg/d	7E-08
	Isophorone	0.018	mg/L	0.071	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Acetone	0.187	mg/L	0.759	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	1.136	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.125	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	3.894	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.070	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.098	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Antimony	0.00249	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
										Total Cancer Risk	**7E-05**

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

TABLE 8.21a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Chloroform	0.865	mg/L	0.865	mg/L	M	7.11E-03	mg/kg/d	6.10E-03	1/mg/kg/d	4E-05
	Isophorone	0.018	mg/L	0.018	mg/L	M	1.45E-04	mg/kg/d	9.50E-04	1/mg/kg/d	1E-07
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	3.29E-04	mg/kg/d	7.50E-03	1/mg/kg/d	2E-06
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	1.15E-05	mg/kg/d	1.50E+00	1/mg/kg/d	2E-05
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										6E-05
Dermal	Chloroform	0.865	mg/L	0.865	mg/L	M	1.61E-04	mg/kg/d	6.10E-03	1/mg/kg/d	1E-06
	Methylene chloride	0.018	mg/L	0.018	mg/L	M	3.76E-06	mg/kg/d	7.50E-03	1/mg/kg/d	3E-08
	Isophorone	0.040	mg/L	0.040	mg/L	M	1.62E-06	mg/kg/d	9.50E-04	1/mg/kg/d	2E-09
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	7.90E-11	mg/kg/d	1.47E+00	1/mg/kg/d	1E-10
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										1E-06
									Total Cancer Risk		6E-05

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established.
NA - Not Applicable

304029

TABLE 8.21b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Chloroform	0.865	mg/L	0.865	mg/L	M	4.12E-03	mg/kg/d	6.10E-03	1/mg/kg/d	3E-05
	Isophorone	0.018	mg/L	0.018	mg/L	M	8.39E-05	mg/kg/d	9.50E-04	1/mg/kg/d	8E-08
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.91E-04	mg/kg/d	7.50E-03	1/mg/kg/d	1E-06
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	6.67E-06	mg/kg/d	1.50E+00	1/mg/kg/d	1E-05
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										4E-05
Dermal	Chloroform	0.865	mg/L	0.865	mg/L	M	5.06E-05	mg/kg/d	6.10E-03	1/mg/kg/d	3E-07
	Isophorone	0.018	mg/L	0.018	mg/L	M	5.09E-07	mg/kg/d	9.50E-04	1/mg/kg/d	5E-10
	Methylene chloride	0.040	mg/L	0.040	mg/L	M	1.18E-06	mg/kg/d	7.50E-03	1/mg/kg/d	9E-09
	Acetone	0.187	mg/L	0.187	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	0.280	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.031	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	0.960	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.017	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.024	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	0.001	mg/L	M	2.48E-11	mg/kg/d	1.47E+00	1/mg/kg/d	4E-11
	Antimony	0.00249	mg/L	0.00249	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	0.160	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	0.005	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	10.1	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	1.614	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	7.300	mg/L	M	NA	mg/kg/d	NE	1/mg/kg/d	NA
	(Total)										3E-07
									Total Cancer Risk		4E-05

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

304030

TABLE 8.22a - RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Chloroform	0.865	mg/L	3.590	mg/m^3	R	4.28E-03	mg/kg/d	8.10E-02	1/mg/kg/d	**3E-04**
	Methylene chloride	0.040	mg/L	0.162	mg/m^3	R	1.98E-04	mg/kg/d	1.65E-03	1/mg/kg/d	3E-07
	Isophorone	0.018	mg/L	0.071	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Acetone	0.187	mg/L	0.759	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	1.136	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.125	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	3.894	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.070	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.098	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Antimony	0.00249	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
									Total Cancer Risk		**3E-04**

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

TABLE 8.22b - CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Water Vapors Via Bathing
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Chloroform	0.865	mg/L	3.590	mg/m^3	R	1.35E-03	mg/kg/d	8.10E-02	1/mg/kg/d	**1E-04**
	Methylene chloride	0.040	mg/L	0.162	mg/m^3	R	6.22E-05	mg/kg/d	1.65E-03	1/mg/kg/d	1E-07
	Isophorone	0.018	mg/L	0.071	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Acetone	0.187	mg/L	0.759	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Ethylbenzene	0.280	mg/L	1.136	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Toluene	0.031	mg/L	0.125	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Xylenes	0.960	mg/L	3.894	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2,4-Dimethylphenol	0.017	mg/L	0.070	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	2-Methylphenol	0.024	mg/L	0.098	mg/m^3	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Arsenic	0.001	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Antimony	0.00249	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Barium	0.160	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Chromium	0.005	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Iron	10.1	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Manganese (nonfood)	1.614	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Lead	7.300	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
	Vanadium	0.025	mg/L	NA	NA	R	NA	mg/kg/d	NE	1/mg/kg/d	NA
									Total Cancer Risk		**1E-04**

M - Medium-Specific EPC selected for hazard calculation.
NE - Not established
NA - Not Applicable

TABLE 9.1a - RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	9E-07		2E-07	1E-06	Arsenic	skin	4.6E-03		1.1E-03	5.8E-03
			Chromium	NA		NA	NA	Chromium	lung	1.7E-03		NA	1.7E-03
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	2.8E-02		NA	2.8E-02
			Manganese	NA		NA	NA	Manganese	CNS	1.1E-02		NA	1.1E-02
			Vanadium	NA		NA	NA	Vanadium	hair proteins	3.2E-03		NA	3.2E-03
			Zinc	NA		NA	NA	Zinc	blood	2.5E-03		NA	2.5E-03
			(Total)	9E-07		2E-07	1E-06	(Total)		5.1E-02		1.1E-03	5.2E-02
	Air	Surface Soil (Particulates)	Arsenic		5E-10		5E-10	Arsenic	skin		NA		NA
			Chromium		5E-09		5E-09	Chromium	lung		8.7E-06		8.7E-06
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		7.6E-04		7.6E-04
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			Zinc		NA		NA	Zinc	blood		NA		NA
			(Total)		5E-09		5E-09	(Total)			7.7E-04		7.7E-04
				Total Risk Across Surface Soil			1E-06	Total Hazard Quotient Across Surface Soil					5.3E-02
Soil/Sediment	Soil/Sediment	Gut System	Aluminum	NA		NA	NA	Aluminum	GI tract	2.3E-03		NA	2.3E-03
			Arsenic	2E-07		5E-08	3E-07	Arsenic	skin	1.1E-03		2.7E-04	1.4E-03
			Chromium	NA		NA	NA	Chromium	lung	1.3E-03		NA	1.3E-03
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	1.3E-02		NA	1.3E-02
			Manganese	NA		NA	NA	Manganese	CNS	4.9E-03		NA	4.9E-03
			Vanadium	NA		NA	NA	Vanadium	hair proteins	1.4E-03		NA	1.4E-03
			(Total)	2E-07		5E-08	3E-07	(Total)		2.4E-02		2.7E-04	2.4E-02
	Air	Gut System (Particulates)	Aluminum		NA		NA	Aluminum	GI tract		1.2E-04		1.2E-04
			Arsenic		1E-10		1E-10	Arsenic	skin		NA		NA
			Chromium		3E-09		3E-09	Chromium	lung		6.4E-06		6.4E-06
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		3.5E-04		3.5E-04
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		4E-09		4E-09	(Total)			4.7E-04		4.7E-04
				Total Risk Across Soil/Sediment			3E-07	Total Hazard Quotient Across Soil/Sediment					2.5E-02
			Total Risk Across All Media and All Exposure Routes				1E-06	Total Hazard Index Across All Media and All Exposure Routes					7.7E-02

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
NA - Not applicable. COPC identified as noncarcinogenic

Total Skin HI =	7.1E-03
Total Liver/Heart/Pancreas HI =	4.1E-02
Total CNS HI =	1.7E-02
Total GI tract HI =	2.4E-03
Total lung HI =	3.0E-03
Total hair proteins HI =	4.6E-03
Total blood HI =	2.5E-03

304033

TABLE 9.1b - CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	1E-07		4E-09	1E-07	Arsenic	skin	NA		NA	NA
			Chromium	NA		NA	NA	Chromium	lung	NA		NA	NA
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	NA		NA	NA
			Manganese	NA		NA	NA	Manganese	CNS	NA		NA	NA
			Vanadium	NA		NA	NA	Vanadium	hair proteins	NA		NA	NA
			Zinc	NA		NA	NA	Zinc	blood	NA		NA	NN
			(Total)	1E-07		4E-09	1E-07	(Total)		NA		NA	NA
	Air	Surface Soil (Particulates)	Arsenic		3E-11		3E-11	Arsenic	skin		NA		NA
			Chromium		4E-10		4E-10	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			Zinc		NA		NA	Zinc	blood		NA		NA
			(Total)		4E-10		4E-10	(Total)			NA		NA
				Total Risk Across Surface Soil			1E-07	Total Hazard Quotient Across Surface Soil					NA
Soil/Sediment	Soil/Sediment	Gut System	Aluminum	NA		NA	NA	Aluminum	GI tract	NA		NA	NA
			Arsenic	NA		NA	NA	Arsenic	skin	NA		NA	NA
			Chromium	NA		NA	NA	Chromium	lung	NA		NA	NA
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	NA		NA	NA
			Manganese	NA		NA	NA	Manganese	CNS	NA		NA	NA
			Vanadium	NA		NA	NA	Vanadium	hair proteins	NA		NA	NA
			(Total)	NA		NA	NA	(Total)		NA		NA	NA
	Air	Gut System (Particulates)	Aluminum		NA		NA	Aluminum	GI tract		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		NA		NA	(Total)			NA		NA
				Total Risk Across Soil/Sediment			NA	Total Hazard Quotient Across Soil/Sediment					NA
			Total Risk Across All Media and All Exposure Routes				1E-07	Total Hazard Index Across All Media and All Exposure Routes					NA

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
NA - Not applicable. COPC identified as noncarcinogenic

304034

TABLE 9.2 - RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	5E-07		8E-08	5E-07	Arsenic	skin	1.4E-02		2.5E-03	1.7E-02
			Chromium	NA		NA	NA	Chromium	lung	5.4E-03		NA	5.4E-03
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	8.6E-02		NA	8.6E-02
			Manganese	NA		NA	NA	Manganese	CNS	3.4E-02		NA	3.4E-02
			Vanadium	NA		NA	NA	Vanadium	hair proteins	9.9E-03		NA	9.9E-03
			Zinc	NA		NA	NA	Zinc	blood	7.9E-03		NA	7.9E-03
			(Total)	5E-07		8E-08	5E-07	(Total)		1.6E-01		2.5E-03	1.6E-01
	Air	Surface Soil (Particulates)	Arsenic		6E-11		6E-11	Arsenic	skin		NA		NA
			Chromium		6E-10		6E-10	Chromium	lung		6.8E-06		6.8E-06
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		6.0E-04		6.0E-04
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			Zinc		NA		NA	Zinc	blood		NA		NA
			(Total)		7E-10		7E-10	(Total)			6.0E-04		6.0E-04
				Total Risk Across Surface Soil			5E-07			Total Hazard Quotient from Soil			1.6E-01
Soil/Sediment	Soil/Sediment	Gut System	Aluminum	NA		NA	NA	Aluminum	GI tract	7.2E-03		NA	7.2E-03
			Arsenic	1E-07		2E-08	1E-07	Arsenic	skin	3.4E-03		5.9E-04	4.0E-03
			Chromium	NA		NA	NA	Chromium	lung	3.9E-03		NA	3.9E-03
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	4.0E-02		NA	4.0E-02
			Manganese	NA		NA	NA	Manganese	CNS	1.5E-02		NA	1.5E-02
			Vanadium	NA		NA	NA	Vanadium	hair proteins	4.4E-03		NA	4.4E-03
			(Total)	1E-07		2E-08	1E-07	(Total)		7.5E-02		5.9E-04	7.5E-02
	Air	Gut System (Particulates)	Aluminum		NA			Aluminum	GI tract		9.2E-05		9.2E-05
			Arsenic		1E-11			Arsenic	skin		NA		NA
			Chromium		4E-10			Chromium	lung		5.0E-06		5.0E-06
			Iron		NA			Iron	liver, heart, pancreas		NA		NA
			Manganese		NA			Manganese	CNS		2.7E-04		2.7E-04
			Vanadium		NA			Vanadium	hair proteins		NA		NA
			(Total)		5E-10		5E-10	(Total)			3.7E-04		3.7E-04
				Total Risk AcrossSoil/Sediment			1E-07		Total Hazard Quotient from Soil/Sediment				7.5E-02
			Total Risk Across All Media and All Exposure Routes				7E-07		Total Hazard Index across all media and all exposure routes				2.4E-01

Total Skin HI =	2.1E-02
Total Liver/Heart/Pancreas HI =	1.3E-01
Total CNS HI =	5.0E-02
Total Hair proteins HI =	1.4E-02
Total Blood HI =	7.9E-03
Total Lung HI =	9.3E-03

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
NA - Not applicable.

304035

TABLE 9.3a. - RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Receptor Population: Industrial Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Local Aquifers (Alluvium & Kingshill)	Acetone	NA		NA	NA	Acetone	liver, kidney	2.2E-02		2.9E-04	2.2E-02
			Chloroform	2E-05		4E-06	3E-05	Chloroform	liver	1.0E+00		2.0E-01	1.2E+00
			Ethylbenzene	NA		NA	NA	Ethylbenzene	liver, kidney	3.3E-02		6.5E-02	9.8E-02
			Methylene chloride	1E-06		1E-07	1E-06	Methylene chloride	liver	7.8E-03		7.7E-04	8.6E-03
			Toluene	NA		NA	NA	Toluene	liver/kidney	1.8E-03		2.2E-03	4.1E-03
			Xylenes	NA		NA	NA	Xylenes	CNS	5.6E-03		9.9E-03	1.6E-02
			2,4-Dimethylphenol	NA		NA	NA	2,4-Dimethylphenol	blood	1.0E-02		3.3E-03	1.3E-02
			Isophorone	7E-08		7E-09	8E-08	Isophorone	kidney	1.0E-03		1.0E-04	1.1E-03
			2-Methylphenol	NA		NA	NA	2-Methylphenol	CNS	5.7E-03		1.2E-03	6.9E-03
			Antimony	NA		NA	NA	Antimony	blood	7.3E-02		8.0E-03	8.1E-02
			Arsenic	9E-06		4E-10	9E-06	Arsenic	skin	5.4E-02		3.3E-06	5.4E-02
			Barium	NA		NA	NA	Barium	kidney	2.7E-02		3.0E-03	3.0E-02
			Chromium	NA		NA	NA	Chromium	lung	2.0E-02		4.4E-02	6.3E-02
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	4.0E-01		8.7E-02	4.8E-01
			Lead	NA		NA	NA	Lead	NA	NA		NA	NA
			Manganese	NA		NA	NA	Manganese	CNS	9.5E-01		2.1E-01	1.2E+00
			Vanadium	NA		NA	NA	Vanadium	hair proteins	4.2E-02		4.6E-03	4.7E-02
			(Total)	3E-05		4E-06	4E-05	(Total)		2.7E+00		6.4E-01	3.3E+00
	Air	Local Aquifers (Alluvium & Kingshill)	Acetone		NA		NA	Acetone	liver, kidney		NA		NA
			Chloroform		8E-04		8E-04	Chloroform	liver, kidney		3.3E+02		3.3E+02
			Ethylbenzene		NA		NA	Ethylbenzene	liver, kidney		3.1E-02		3.1E-02
			Methylene chloride		8E-07		8E-07	Methylene chloride	liver		1.5E-03		1.5E-03
			Toluene		NA		NA	Toluene	liver/kidney		8.8E-03		8.8E-03
			Xylenes		NA		NA	Xylenes	CNS		NA		NA
			2,4-Dimethylphenol		NA		NA	2,4-Dimethylphenol	blood		NA		NA
			Isophorone		NA		NA	Isophorone	kidney		NA		NA
			2-Methylphenol		NA		NA	2-Methylphenol	CNS		NA		NA
			Antimony		NA		NA	Antimony	blood		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Barium		NA		NA	Barium	kidney		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Lead		NA		NA	Lead	NA		NA		NA
			Manganese		NA		NA	Manganese	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			Zinc		NA			Zinc					
			(Total)		8E-04		8E-04	(Total)			3.3E+02		3.3E+02
					Total Risk Across Groundwater		9E-04						3.3E+02
Surface Soil	Surface Soil	Surface Soil	Arsenic	2E-06		7E-07	2E-06	Arsenic	skin	1.1E-02		4.5E-03	1.6E-02
			Chromium	NA		NA	NA	Chromium	lung	4.2E-03		NA	4.2E-03
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	6.7E-02		NA	6.7E-02
			Manganese	NA		NA	NA	Manganese	CNS	2.6E-02		NA	2.6E-02
			Vanadium	NA		NA	NA	Vanadium	hair proteins	7.6E-03		NA	7.6E-03
			Zinc	NA		NA	NA	Zinc	blood	6.1E-03		NA	6.1E-03
			(Total)	2E-06		7E-07	2E-06	(Total)		1.2E-01		4.5E-03	1.3E-01
	Air	Surface Soil	Arsenic		2E-09		2E-09	Arsenic	skin		NA		NA
			Chromium		2E-08		2E-08	Chromium	lung		4.2E-05		4.2E-05
		(Particulates)	Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		3.7E-03		3.7E-03
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			Zinc		NA		NA	Zinc	blood		NA		NA
			(Total)		2E-08		2E-08	(Total)			3.7E-03		3.7E-03
					Total Risk Across Surface Soil		3E-06						1.3E-01
Soil Sediment	Soil Sediment	Gut System	Aluminum	NA		NA	NA	Aluminum	GI tract	5.6E-03		NA	5.6E-03
			Arsenic	4E-07		2E-07	6E-07	Arsenic	skin	2.7E-03		1.1E-03	3.7E-03
			Chromium	NA		NA	NA	Chromium	lung	3.0E-03		NA	3.0E-03
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	3.1E-02		NA	3.1E-02
			Manganese	NA		NA	NA	Manganese	CNS	1.2E-02		NA	1.2E-02
			Vanadium	NA		NA	NA	Vanadium	hair proteins	3.4E-03		NA	3.4E-03
				4E-07		2E-07	6E-07	(Total)		3.8E-02		1.1E-03	5.9E-02
	Air	Gut System	Aluminum		NA		NA	Aluminum	GI tract		5.6E-04		5.6E-04
			Arsenic		4E-10		4E-10	Arsenic	skin		NA		NA
		(Particulates)	Chromium		1E-08		1E-08	Chromium	lung		3.1E-05		3.1E-05
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		1.7E-03		1.7E-03
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		1E-08		1E-08	(Total)			1.3E-03		1.3E-03
					Total Risk Across Soil Sediment		6E-07						6.1E-02
					Total Risk across all media and all exposure routes		9E-04				Total Hazard Index across all media and all exposure routes		3.3E+02

Total Liver Kidney HI =	3.3E+02
Total Hair Proteins =	5.8E-02
Total Skin HI =	7.3E-02
Total CNS HI =	1.2E+00
Total blood =	1.0E-01
Total Liver/Heart Pancreas HI =	3.8E-01
Total lung	7.1E-02
Total GI Tract	6.1E-03

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-5} to 10^{-4} range or noncarcinogenic hazards exceeding 1

NA - Not applicable.

COPCs not evaluated for inhalation exposures are not considered to be volatile.

304036

TABLE 9.3b. - CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Local Aquifers (Alluvium & Kingthill)	Acetone	NA		NA	NA	Acetone	liver, kidney	1.3E-02		2.7E-04	1.3E-02
			Chloroform	3E-06		1E-06	5E-06	Chloroform	liver	5.9E-01		2.0E-01	7.9E-01
			Ethylbenzene	NA		NA	NA	Ethylbenzene	liver, kidney	1.9E-02		6.5E-02	8.4E-02
			Methylene chloride	2E-07		3E-08	2E-07	Methylene chloride	liver	4.6E-03		7.7E-04	5.3E-03
			Toluene	NA		NA	NA	Toluene	liver,kidney	1.1E-03		2.2E-03	3.3E-03
			Xylenes	NA		NA	NA	Xylenes	CNS	3.3E-03		9.9E-03	1.3E-02
			2,4-Dimethylphenol	NA		NA	NA	2,4-Dimethylphenol	blood	5.9E-03		3.3E-03	9.2E-03
			Isophorone	1E-08		2E-09	1E-08	Isophorone	kidney	6.0E-04		1.0E-04	7.0E-04
			2-Methylphenol	NA		NA	NA	2-Methylphenol	CNS	3.3E-03		1.3E-03	4.6E-03
			Antimony	NA		NA	NA	Antimony	blood	4.3E-02		8.0E-03	5.1E-02
			Arsenic	1E-06		1E-10	1E-06	Arsenic	skin	3.2E-02		3.3E-06	3.2E-02
			Barium	NA		NA	NA	Barium	kidney	1.6E-02		3.0E-03	1.9E-02
			Chromium	NA		NA	NA	Chromium	lung	1.2E-02		4.4E-02	5.5E-02
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	2.3E-01		8.7E-02	3.2E-01
			Lead	NA		NA	NA	Lead	NA	NA		NA	NA
			Manganese	NA		NA	NA	Manganese	CNS	5.5E-01		2.1E-01	7.6E-01
			Vanadium	NA		NA	NA	Vanadium	hair proteins	2.4E-02		4.6E-03	2.9E-02
			(Total)	5E-06		1E-06	6E-06	(Total)		1.6E+00		6.4E-01	2.2E+00
	Air	Local Aquifers (Alluvium & Kingthill)	Acetone		NA		NA	Acetone	liver, kidney		NA		NA
			Chloroform		1E-04		1E-04	Chloroform	liver, kidney		3.3E+02		3.3E+02
			Ethylbenzene		NA		NA	Ethylbenzene	liver, kidney		3.1E-02		3.1E-02
			Methylene chloride		2E-07		2E-07	Methylene chloride	liver		1.5E-03		1.5E-03
			Toluene		NA		NA	Toluene	liver,kidney		8.8E-03		8.8E-03
			Xylenes		NA		NA	Xylenes	CNS		NA		NA
			2,4-Dimethylphenol		NA		NA	2,4-Dimethylphenol	blood		NA		NA
			Isophorone		NA		NA	Isophorone	kidney		NA		NA
			2-Methylphenol		NA		NA	2-Methylphenol	CNS		NA		NA
			Antimony		NA		NA	Antimony	blood		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Barium		NA		NA	Barium	kidney		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Lead		NA		NA	Lead	NA		NA		NA
			Manganese		NA		NA	Manganese	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		2E-04		2E-04	(Total)			3.3E+02		3.3E+02
					Total Risk Across Groundwater		2E-04						3.3E+02
Surface Soil	Surface Soil	Surface Soil	Arsenic	5E-07		2E-08	5E-07	Arsenic	skin	NA		NA	NA
			Chromium	NA		NA	NA	Chromium	lung	NA		NA	NA
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	NA		NA	NA
			Manganese	NA		NA	NA	Manganese	CNS	NA		NA	NA
			Vanadium	NA		NA	NA	Vanadium	hair proteins	NA		NA	NA
			Zinc	NA		NA	NA	Zinc	blood	NA		NA	NA
			(Total)	5E-07		2E-08	5E-07	(Total)		NA		NA	NA
	Air	Surface Soil (Particulates)	Arsenic		NA		NA	Arsenic	skin		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			Zinc		NA		NA	Zinc	blood		NA		NA
			(Total)		NA		NA	(Total)			NA		NA
					Total Risk Across Surface Soil		5E-07			Total Hazard Quotient Across Soil			NA
Soil Sediment	Soil Sediment	Gut System	Aluminum	NA		NA	NA	Aluminum	GI tract	NA		NA	NA
			Arsenic	NA		NA	NA	Arsenic	skin	NA		NA	NA
			Chromium	NA		NA	NA	Chromium	lung	NA		NA	NA
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	NA		NA	NA
			Manganese	NA		NA	NA	Manganese	CNS	NA		NA	NA
			Vanadium	NA		NA	NA	Vanadium	hair proteins	NA		NA	NA
			(Total)	NA		NA	NA	(Total)		NA		NA	NA
	Air	Gut System (Particulates)	Aluminum		NA		NA	Aluminum	GI tract		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		NA		NA	(Total)					NA
					Total Risk Across Soil Sediment		NA						NA
			Total Risk across all media and all exposure routes				2E-04		Total Hazard Index across all media and all exposure routes				3.3E+02

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
NA - Not applicable.
NE - Not evaluated.

Total Liver Kidney HI =	3.3E+02
Total Hair Proteins HI =	2.9E-02
Total Skin HI =	3.2E-02
Total CNS HI =	7.7E-01
Total blood HI =	6.0E-02
Total Liver Heart Pancreas HI =	3.2E-01
Total lung HI =	5.5E-02

304037

TABLE 9.4a - RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
ISLAND CHEMICAL

Scenario Timeframe: Future
Receptor Population: Construction
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	7E-07		3E-08	7E-07	Arsenic	skin	1.1E-01		4.5E-03	1.1E-01
			Chromium	NA		NA	NA	Chromium	lung	4.0E-02		NA	4.0E-02
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	6.4E-01		NA	6.4E-01
			Manganese	NA		NA	NA	Manganese	CNS	2.5E-01		NA	2.5E-01
			Vanadium	NA		NA	NA	Vanadium	hair proteins	7.3E-02		NA	7.3E-02
			Zinc	NA		NA	NA	Zinc	blood	5.8E-02		NA	5.8E-02
			(Total)	7E-07		3E-08	7E-07	(Total)		**1.2E+00**		4.5E-03	**1.2E+00**
	Air	Surface Soil (Particulates)	Arsenic		3E-10		3E-10	Arsenic	skin		NA		NA
			Chromium		3E-09		3E-09	Chromium	lung		1.8E-04		1.8E-04
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		1.5E-02		1.5E-02
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			Zinc		NA		NA	Zinc	blood		NA		NA
			(Total)		3E-09		3E-09	(Total)			1.6E-02		1.6E-02
				Total Risk Across Surface Soil			7E-07			Total Hazard Index Across Soil			**1.2E+00**
Soil/Sediment	Soil/Sediment	Gut System	Aluminum	NA		NA	NA	Aluminum	GI tract	5.4E-02		NA	5.4E-02
			Arsenic	2E-07		7E-09	2E-07	Arsenic	skin	2.6E-02		1.1E-03	2.7E-02
			Chromium	NA		NA	NA	Chromium	lung	2.9E-02		NA	2.9E-02
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	3.0E-01		NA	3.0E-01
			Manganese	NA		NA	NA	Manganese	CNS	1.1E-01		NA	1.1E-01
			Vanadium	NA		NA	NA	Vanadium	hair proteins	3.3E-02		NA	3.3E-02
			(Total)	2E-07		7E-09	2E-07	(Total)		5.5E-01		1.1E-03	5.5E-01
	Air	Gut System (Particulates)	Aluminum		NA		NA	Aluminum	GI tract		2.4E-03		2.4E-03
			Arsenic		7E-11		7E-11	Arsenic	skin		NA		NA
			Chromium		2E-09		2E-09	Chromium	lung		1.3E-04		1.3E-04
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		7.1E-03		7.1E-03
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		2E-09		2E-09	(Total)			9.5E-03		9.5E-03
				Total Risk Across Soil/Sediment			2E-07			tal Hazard Index Across Soil/Sediment			5.6E-01
			Total Risk across all media and all exposure routes				9E-07	Total Hazard Index across all media and all exposure routes					**1.8E+00**

NA - Not applicable.

Total Skin HI =	1.4E-01
Total Liver/Heart/Pancreas HI =	9.4E-01
Total CNS HI =	3.9E-01
Total Blood HI =	5.8E-02
Total Hair Proteins HI =	1.1E-01
Total GI Tract HI =	5.6E-02

304038

TABLE 9.4b - CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
ISLAND CHEMICAL

Scenario Timeframe: Future
Receptor Population: Construction
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Arsenic	NA		NA	NA	Arsenic	skin	2.2E-02		4.5E-04	2.3E-02
			Chromium	NA		NA	NA	Chromium	lung	8.3E-03		NA	8.3E-03
			Iron	NA		NA	NA	Iron	liver, heart,	1.3E-01		NA	1.3E-01
			Manganese	NA		NA	NA	Manganese	CNS	5.2E-02		NA	5.2E-02
			Vanadium	NA		NA	NA	Vanadium	hair proteins	1.5E-02		NA	1.5E-02
			Zinc	NA		NA	NA	Zinc	blood	1.2E-02		NA	1.2E-02
			(Total)	NA		NA	NA	(Total)		2.4E-01		4.5E-04	2.4E-01
	Air	Surface Soil (Particulates)	Arsenic		NA		NA	Arsenic	skin		NA		NA
			Chromium		NA		NA	Chromium	lung		6.6E-05		6.6E-05
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		5.7E-03		5.7E-03
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			Zinc		NA		NA	Zinc	blood		NA		NA
			(Total)		NA		NA	(Total)			5.8E-03		5.8E-03
							NA				Total Hazard Quotient Across Soil		2.5E-01
Soil/Sediment	Soil/Sediment	Gut System	Aluminum	NA		NA	NA	Aluminum	GI tract	NA		NA	NA
			Arsenic	NA		NA	NA	Arsenic	skin	NA		NA	NA
			Chromium	NA		NA	NA	Chromium	lung	NA		NA	NA
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	NA		NA	NA
			Manganese	NA		NA	NA	Manganese	CNS	NA		NA	NA
			Vanadium	NA		NA	NA	Vanadium	hair proteins	NA		NA	NA
			(Total)	NA		NA	NA	(Total)		NA		NA	NA
	Air	Gut System (Particulates)	Aluminum		NA		NA	Aluminum	GI tract		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Manganese		NA		NA	Manganese	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		NA		NA	(Total)			NA		NA
							NA		Total Hazard Quotient Across Soil/Sediment				NA
							NA		Total Hazard Index across all media and all exposure routes				2.5E-01

NA - Not applicable.

Total Skin HI =	2.3E-02
Total Liver/Heart/Pancreas HI =	1.3E-01
Total CNS HI =	5.8E-02
Total Blood HI =	1.2E-02
Total Hair Proteins HI =	1.5E-02

304039

TABLE 9.5a - RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Acetone	NA		NA	NA	Acetone	liver, kidney	6.1E-02		1.4E-04	6.2E-02
			Chloroform	7E-05		3E-06	8E-05	Chloroform	liver	**2.8E+00**		1.0E-01	**2.9E+00**
			Dimethylphenol, 2,4-	NA		NA	NA	Dimethylphenol, 2,4-	blood	2.8E-02		1.7E-03	3.0E-02
			Ethylbenzene	NA		NA	NA	Ethylbenzene	liver, kidney	9.2E-02		3.3E-02	1.3E-01
			Isophorone	2E-07		4E-09	2E-07	Isophorone	kidney	2.9E-03		5.1E-05	2.9E-03
			Methylene chloride	4E-06		8E-08	4E-06	Methylene chloride	liver	2.2E-02		4.0E-04	2.2E-02
			Methylphenol, 2-	NA		NA	NA	Methylphenol, 2-	CNS	1.6E-02		6.4E-04	1.6E-02
			Toluene	NA		NA	NA	Toluene	liver, kidney	5.1E-03		1.1E-03	6.2E-03
			Xylenes	NA		NA	NA	Xylenes	CNS	1.6E-02		5.1E-03	2.1E-02
			Antimony	NA		NA	NA	Antimony	blood	2.0E-01		4.1E-03	2.1E-01
			Arsenic	3E-05		3E-10	3E-05	Arsenic	skin	1.5E-01		1.7E-06	1.5E-01
			Barium	NA		NA	NA	Barium	kidney	7.5E-02		1.5E-03	7.7E-02
			Chromium	NA		NA	NA	Chromium	lung	5.5E-02		2.2E-02	7.8E-02
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	**1.1E+00**		4.4E-02	**1.2E+00**
			Lead	NA		NA	NA	Lead	--	NA		NA	NA
			Manganese (nonfood)	NA		NA	NA	Manganese (nonfood)	CNS	**2.7E+00**		1.1E-01	**2.8E+00**
			Vanadium	NA		NA	NA	Vanadium	hair proteins	1.2E-01		2.4E-03	1.2E-01
			(Total)	1E-04		3E-06	1E-04	(Total)		7.5E+00		3.2E-01	7.8E+00
	Air	Water Vapors Via Bathing	Acetone		NA		NA	Acetone	liver, kidney		NA		NA
			Chloroform		7E-04		7E-04	Chloroform	liver		**2.5E+02**		**2.5E+02**
			Dimethylphenol, 2,4-		NA		NA	Dimethylphenol, 2,4-	blood		NA		NA
			Ethylbenzene		NA		NA	Ethylbenzene	liver, kidney		2.4E-02		2.4E-02
			Isophorone		NA		NA	Isophorone	kidney		NA		NA
			Methylene chloride		7E-07		7E-07	Methylene chloride	liver		1.1E-03		1.1E-03
			Methylphenol, 2-		NA		NA	Methylphenol, 2-	CNS		NA		NA
			Toluene		NA		NA	Toluene	liver, kidney		6.6E-03		6.6E-03
			Xylenes		NA		NA	Xylenes	CNS		NA		NA
			Antimony		NA		NA	Antimony	blood		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Barium		NA		NA	Barium	kidney		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Lead		NA		NA	Lead	--		NA		NA
			Manganese (nonfood)		NA		NA	Manganese (nonfood)	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		7E-04		7E-04	(Total)			2.5E+02		2.5E+02
					Total Risk Across Groundwater		8E-04				Total Hazard Quotient Across Groundwater		2.5E+02

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.

NA - Not applicable. COPC is not evaluated via this pathway.

COPCs not evaluated for inhalation exposures are not considered to be volatile.

Total Liver/Kidney HI =	2.5E+02
Total Hair Proteins =	1.2E-01
Total Skin HI =	1.5E-01
Total CNS HI =	2.8E+00
Total blood =	2.4E-01
Total Liver/Heart/Pancreas HI =	1.2E+00
Total lung	7.8E-02

304040

TABLE 9.5b - CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Acetone	NA		NA	NA	Acetone	liver, kidney	3.6E-02		4.4E-05	3.6E-02
			Chloroform	1E-05		3E-07	1E-05	Chloroform	liver	1.7E+00		3.2E-02	1.7E+00
			Dimethylphenol, 2,4-	NA		NA	NA	Dimethylphenol, 2,4-	blood	1.6E-02		5.3E-04	1.7E-02
			Ethylbenzene	NA		NA	NA	Ethylbenzene	liver, kidney	5.4E-02		1.0E-02	6.4E-02
			Isophorone	4E-08		4E-10	4E-08	Isophorone	kidney	1.7E-03		1.6E-05	1.7E-03
			Methylene chloride	7E-07		7E-09	7E-07	Methylene chloride	liver	1.3E-02		1.2E-04	1.3E-02
			Methylphenol, 2-	NA		NA	NA	Methylphenol, 2-	CNS	9.2E-03		2.0E-04	9.4E-03
			Toluene	NA		NA	NA	Toluene	liver, kidney	3.0E-03		3.6E-04	3.3E-03
			Xylenes	NA		NA	NA	Xylenes	CNS	9.2E-03		1.6E-03	1.1E-02
			Antimony	NA		NA	NA	Antimony	blood	1.2E-01		1.3E-03	1.2E-01
			Arsenic	5E-06		3E-11	5E-06	Arsenic	skin	8.9E-02		5.3E-07	8.9E-02
			Barium	NA		NA	NA	Barium	kidney	4.4E-02		4.7E-04	4.4E-02
			Chromium	NA		NA	NA	Chromium	lung	3.2E-02		7.0E-03	3.9E-02
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	6.5E-01		1.4E-02	6.6E-01
			Lead	NA		NA	NA	Lead	--	NA		NA	NA
			Manganese (nonfood)	NA		NA	NA	Manganese (nonfood)	CNS	1.5E+00		3.3E-02	1.6E+00
			Vanadium	NA		NA	NA	Vanadium	hair proteins	6.8E-02		7.4E-04	6.9E-02
			(Total)	2E-05		3E-07	2E-05	(Total)		4.3E+00		1.0E-01	4.4E+00
	Air	Water Vapors Via Bathing	Acetone		NA		NA	Acetone	liver, kidney		NA		NA
			Chloroform		7E-05		7E-05	Chloroform	liver		7.8E+01		7.8E+01
			Dimethylphenol, 2,4-		NA		NA	Dimethylphenol, 2,4-	blood		NA		NA
			Ethylbenzene		NA		NA	Ethylbenzene	liver, kidney		7.4E-03		7.4E-03
			Isophorone		NA		NA	Isophorone	kidney		NA		NA
			Methylene chloride		7E-08		7E-08	Methylene chloride	liver		3.6E-04		3.6E-04
			Methylphenol, 2-		NA		NA	Methylphenol, 2-	CNS		NA		NA
			Toluene		NA		NA	Toluene	liver, kidney		2.1E-03		2.1E-03
			Xylenes		NA		NA	Xylenes	CNS		NA		NA
			Antimony		NA		NA	Antimony	blood		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Barium		NA		NA	Barium	kidney		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Lead		NA		NA	Lead	--		NA		NA
			Manganese (nonfood)		NA		NA	Manganese (nonfood)	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		7E-05		7E-05	(Total)			7.8E+01		7.8E+01
					Total Risk Across Groundwater		9E-05				Total Hazard Quotient Across Groundwater		8.2E+01

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-4} to 10^{-3} range or noncarcinogenic hazards exceeding 1

NA - Not applicable. COPC is not evaluated via this pathway

COPCs not evaluated for inhalation exposures are not considered to be volatile.

Total Liver/Kidney HI =	7.9E+01
Total Hair Proteins =	6.9E-02
Total Skin HI =	8.9E-02
Total CNS HI =	1.6E+00
Total blood =	1.4E-01
Total Liver/Heart/Pancreas HI =	6.6E-01
Total lung	3.9E-02

304041

TABLE 9.6a - RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Acetone	NA		NA	NA	Acetone	liver, kidney	1.8E-01		2.6E-04	1.8E-01
			Chloroform	**4E-05**		1E-06	**4E-05**	Chloroform	liver	**8.3E+00**		1.9E-01	**8.5E+00**
			Dimethylphenol, 2,4-	NA		NA	NA	Dimethylphenol, 2,4-	blood	8.2E-02		3.1E-03	8.6E-02
			Ethylbenzene	NA		NA	NA	Ethylbenzene	liver, kidney	2.7E-01		6.2E-02	3.3E-01
			Isophorone	1E-07		2E-09	1E-07	Isophorone	kidney	8.4E-03		9.4E-05	8.5E-03
			Methylene chloride	**2E-06**		3E-08	**2E-06**	Methylene chloride	liver	6.4E-02		7.3E-04	6.5E-02
			Methylphenol, 2-	NA		NA	NA	Methylphenol, 2-	CNS	4.6E-02		1.2E-03	4.7E-02
			Toluene	NA		NA	NA	Toluene	liver, kidney	1.5E-02		2.1E-03	1.7E-02
			Xylenes	NA		NA	NA	Xylenes	CNS	4.6E-02		9.4E-03	5.5E-02
			Antimony	NA		NA	NA	Antimony	blood	6.0E-01		7.6E-03	6.0E-01
			Arsenic	**2E-05**		1E-10	**2E-05**	Arsenic	skin	4.5E-01		3.1E-06	4.5E-01
			Barium	NA		NA	NA	Barium	kidney	2.2E-01		2.8E-03	2.2E-01
			Chromium	NA		NA	NA	Chromium	lung	1.6E-01		4.1E-02	2.0E-01
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	**3.2E+00**		8.2E-02	**3.3E+00**
			Lead	NA		NA	NA	Lead	--	NA		NA	NA
			Manganese (nonfood)	NA		NA	NA	Manganese (nonfood)	CNS	**7.7E+00**		2.0E-01	**7.9E+00**
			Vanadium	NA		NA	NA	Vanadium	hair proteins	3.4E-01		4.4E-03	3.5E-01
			(Total)	**6E-05**		1E-06	**6E-05**	(Total)		**2.2E+01**		**6.0E-01**	**2.2E+01**
	Air	Water Vapors Via Bathing	Acetone		NA		NA	Acetone	liver, kidney		NA		NA
			Chloroform		**3E-04**		**3E-04**	Chloroform	liver		**5.8E+02**		**5.8E+02**
			Dimethylphenol, 2,4-		NA		NA	Dimethylphenol, 2,4-	blood		NA		NA
			Ethylbenzene		NA		NA	Ethylbenzene	liver, kidney		5.6E-02		5.6E-02
			Isophorone		NA		NA	Isophorone	kidney		NA		NA
			Methylene chloride		3E-07		3E-07	Methylene chloride	liver		2.7E-03		2.7E-03
			Methylphenol, 2-		NA		NA	Methylphenol, 2-	CNS		NA		NA
			Toluene		NA		NA	Toluene	liver, kidney		1.6E-02		1.6E-02
			Xylenes		NA		NA	Xylenes	CNS		NA		NA
			Antimony		NA		NA	Antimony	blood		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Barium		NA		NA	Barium	kidney		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Lead		NA		NA	Lead	--		NA		NA
			Manganese (nonfood)		NA		NA	Manganese (nonfood)	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
			(Total)		**3E-04**		**3E-04**	(Total)			**5.8E+02**		**5.8E+02**
					Total Risk Across Groundwater		**4E-04**					Total Hazard Quotient Across Groundwater	**6.0E+02**

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1

NA - Not applicable COPC is not evaluated via this pathway

COPCs not evaluated for inhalation exposures are not considered to be volatile.

Total Liver/Kidney HI =	**5.9E+02**
Total Hair Proteins =	3.5E-01
Total Skin HI =	4.5E-01
Total CNS HI =	**8.0E+00**
Total blood =	6.9E-01
Total Liver/Heart/Pancreas HI =	**3.3E+00**
Total lung	2.0E-01

304042

TABLE 9.6b - CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Acetone	NA		NA	NA	Acetone	liver, kidney	1.0E-01		8.2E-05	1.0E-01
			Chloroform	3E-05		3E-07	3E-05	Chloroform	liver	4.8E+00		5.9E-02	4.9E+00
			Dimethylphenol, 2,4-	NA		NA	NA	Dimethylphenol, 2,4-	blood	4.8E-02		9.9E-04	4.9E-02
			Ethylbenzene	NA		NA	NA	Ethylbenzene	liver, kidney	1.6E-01		1.9E-02	1.8E-01
			Isophorone	8E-08		5E-10	8E-08	Isophorone	kidney	4.9E-03		3.0E-05	4.9E-03
			Methylene chloride	1E-06		9E-09	1E-06	Methylene chloride	liver	3.7E-02		2.3E-04	3.7E-02
			Methylphenol, 2-	NA		NA	NA	Methylphenol, 2-	CNS	2.7E-02		3.7E-04	2.7E-02
			Toluene	NA		NA	NA	Toluene	liver, kidney	8.6E-03		6.7E-04	9.3E-03
			Xylenes	NA		NA	NA	Xylenes	CNS	2.7E-02		2.9E-03	3.0E-02
			Antimony	NA		NA	NA	Antimony	blood	3.5E-01		2.4E-03	3.5E-01
			Arsenic	1E-05		4E-11	1E-05	Arsenic	skin	2.6E-01		9.9E-07	2.6E-01
			Barium	NA		NA	NA	Barium	kidney	1.3E-01		8.8E-04	1.3E-01
			Chromium	NA		NA	NA	Chromium	lung	9.4E-02		1.3E-02	1.1E-01
			Iron	NA		NA	NA	Iron	liver, heart, pancreas	1.9E+00		2.6E-02	1.9E+00
			Lead	NA		NA	NA	Lead	--	NA		NA	NA
			Manganese (nonfood)	NA		NA	NA	Manganese (nonfood)	CNS	4.5E+00		6.2E-02	4.6E+00
			Vanadium	NA		NA	NA	Vanadium	hair proteins	2.0E-01		1.4E-03	2.0E-01
				4E-05		3E-07	4E-05	(Total)		1.3E+01		1.9E-01	1.3E+01
	Air	Water Vapors Via Bathing	Acetone		NA		NA	Acetone	liver, kidney		NA		NA
			Chloroform		1E-04		1E-04	Chloroform	liver		1.8E+02		1.8E+02
			Dimethylphenol, 2,4-		NA		NA	Dimethylphenol, 2,4-	blood		NA		NA
			Ethylbenzene		NA		NA	Ethylbenzene	liver, kidney		1.8E-02		1.8E-02
			Isophorone		NA		NA	Isophorone	kidney		NA		NA
			Methylene chloride		1E-07		1E-07	Methylene chloride	liver		8.4E-04		8.4E-04
			Methylphenol, 2-		NA		NA	Methylphenol, 2-	CNS		NA		NA
			Toluene		NA		NA	Toluene	liver, kidney		4.9E-03		4.9E-03
			Xylenes		NA		NA	Xylenes	CNS		NA		NA
			Antimony		NA		NA	Antimony	blood		NA		NA
			Arsenic		NA		NA	Arsenic	skin		NA		NA
			Barium		NA		NA	Barium	kidney		NA		NA
			Chromium		NA		NA	Chromium	lung		NA		NA
			Iron		NA		NA	Iron	liver, heart, pancreas		NA		NA
			Lead		NA		NA	Lead	--		NA		NA
			Manganese (nonfood)		NA		NA	Manganese (nonfood)	CNS		NA		NA
			Vanadium		NA		NA	Vanadium	hair proteins		NA		NA
					1E-04		1E-04	(Total)			1.8E+02		1.8E+02
							1E-04					Total Hazard Quotient Across Groundwater	2.0E+02

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1

NA - Not applicable. COPC is not evaluated via this pathway

COPCs not evaluated for inhalation exposures are not considered to be volatile

Total Liver/Kidney HI =	1.9E+02
Total Hair Proteins =	2.0E-01
Total Skin HI =	2.6E-01
Total CNS HI =	4.6E+00
Total blood =	4.0E-01
Total Liver/Heart/Pancreas HI =	1.9E+00
Total lung	1.1E-01

304043

TABLE 9.7a - RME
SUMMARY OF RECEPTOR RISKS FOR COPCs
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult + Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Acetone	NA		NA	NA						
			Chloroform	1E-04		4E-06	1E-04						
			Dimethylphenol, 2,4-	NA		NA	NA						
			Ethylbenzene	NA		NA	NA						
			Isophorone	4E-07		6E-09	4E-07						
			Methylene chloride	7E-06		1E-07	7E-06						
			Methylphenol, 2-	NA		NA	NA						
			Toluene	NA		NA	NA						
			Xylenes	NA		NA	NA						
			Antimony	NA		NA	NA						
			Arsenic	5E-05		4E-10	5E-05						
			Barium	NA		NA	NA						
			Chromium	NA		NA	NA						
			Iron	NA		NA	NA						
			Lead	NA		NA	NA						
			Manganese (nonfood)	NA		NA	NA						
			Vanadium	NA		NA	NA						
			(Total)	2E-04		4E-06	2E-04						
	Air	Water Vapors Via Bathing	Acetone		NA		NA						
			Chloroform		1E-03		1E-03						
			Dimethylphenol, 2,4-		NA		NA						
			Ethylbenzene		NA		NA						
			Isophorone		NA		NA						
			Methylene chloride		1E-06		1E-06						
			Methylphenol, 2-		NA		NA						
			Toluene		NA		NA						
			Xylenes		NA		NA						
			Antimony		NA		NA						
			Arsenic		NA		NA						
			Barium		NA		NA						
			Chromium		NA		NA						
			Iron		NA		NA						
			Lead		NA		NA						
			Manganese (nonfood)		NA		NA						
			Vanadium		NA		NA						
			(Total)		1E-03		1E-03						
					Total Risk Across Groundwater		1E-03		Total Hazard Quotient Across Groundwater				

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.

NA - Not applicable. COPC is not evaluated via this pathway.

COPCs not evaluated for inhalation exposures are not considered to be volatile

The values presented in this table for carcinogenic risk are cumulative values from Tables 9.5a and 9.6a. There are no corresponding Table 8 series tables.

Cumulative non-carcinogenic risks are not presented in this table

Total Liver/Kidney HI =	
Total Hair Proteins =	
Total Skin HI =	
Total CNS HI =	
Total blood =	
Total Liver/Heart/Pancreas HI =	
Total lung	

304044

TABLE 9.7b - CT
SUMMARY OF RECEPTOR RISKS FOR COPCs
CENTRAL TENDENCY

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult + Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Acetone	NA		NA	NA						
			Chloroform	**4E-05**		6E-07	**4E-05**						
			Dimethylphenol, 2,4-	NA		NA	NA						
			Ethylbenzene	NA		NA	NA						
			Isophorone	1E-07		9E-10	1E-07						
			Methylene chloride	**2E-06**		2E-08	**2E-06**						
			Methylphenol, 2-	NA		NA	NA						
			Toluene	NA		NA	NA						
			Xylenes	NA		NA	NA						
			Antimony	NA		NA	NA						
			Arsenic	**2E-05**		7E-11	**2E-05**						
			Barium	NA		NA	NA						
			Chromium	NA		NA	NA						
			Iron	NA		NA	NA						
			Lead	NA		NA	NA						
			Manganese (nonfood)	NA		NA	NA						
			Vanadium	NA		NA	NA						
			(Total)	6E-05		6E-07	6E-05						
	Air	Water Vapors Via Bathing	Acetone		NA		NA						
			Chloroform		**2E-04**		**2E-04**						
			Dimethylphenol, 2,4-		NA		NA						
			Ethylbenzene		NA		NA						
			Isophorone		NA		NA						
			Methylene chloride		2E-07		2E-07						
			Methylphenol, 2-		NA		NA						
			Toluene		NA		NA						
			Xylenes		NA		NA						
			Antimony		NA		NA						
			Arsenic		NA		NA						
			Barium		NA		NA						
			Chromium		NA		NA						
			Iron		NA		NA						
			Lead		NA		NA						
			Manganese (nonfood)		NA		NA						
			Vanadium		NA		NA						
			(Total)		**2E-04**		**2E-04**						
					Total Risk Across Groundwater		**2E-04**		Total Hazard Quotient Across Groundwater				

Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
NA - Not applicable. COPC is not evaluated via this pathway
COPCs not evaluated for inhalation exposures are not considered to be volatile.
The values presented in this table for carcinogenic risk are cumulative values from Tables 9.5b and 9.6b. There are no corresponding Table 8 series tables.
Cumulative non-carcinogenic risks are not presented in this table

Total Liver/Kidney HI =	
Total Hair Proteins =	
Total Skin HI =	
Total CNS HI =	
Total blood =	
Total Liver/Heart/Pancreas HI =	
Total lung	

304045

TABLE 10.1 - RME
RISK ASSESSMENT SUMMARY[2]
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (Alluvium & Kingshill)	Arsenic	9E-07		2E-07	**1E-06**						
			(Total)				**1E-06**		Total Hazard Quotient Across Surface Soil				
	Air	Surface Soil	Arsenic		5E-10		5E-10						
			Chromium		5E-09		5E-09						
			(Total)		5E-09		5E-09						
					Total Risk Across Surface Soil		**1E-06**						

1. Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
2. Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.
3. For total risk calculations refer to the appropriate Table 9.

304046

TABLE 10.2a - RME
RISK ASSESSMENT SUMMARY[2]
REASONABLE MAXIMUM EXPOSURE
Virgin Island Chemical Site

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Local Aquifers (Alluvium & Kingshill)	Chloroform	**2E-05**		**4E-06**	**3E-05**
			Methylene chloride	**1E-06**		1E-07	**1E-06**
			Arsenic	**9E-06**		4E-10	**9E-06**
			(Total)	**3E-05**		**4E-06**	**4E-05**
	Air	Local Aquifers (Alluvium & Kingshill)	Chloroform		**8E-04**		**8E-04**
			(Total)		**8E-04**		**8E-04**
					Total Risk Across Groundwater		**9E-04**
Surface Soil	Surface Soil	Surface Soil	Arsenic	**2E-06**		7E-07	**2E-06**
			(Total)	**2E-06**		7E-07	**2E-06**
					Total Risk Across Surface Soil		**2E-06**
						Total Risk Across All Media and All Exposure Routes	**9.E-04**

Chemical	Non-Carcinogenic Hazard Quotient				
	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Chloroform	liver	**1.0E+00**		2.0E-01	**1.2E+00**
Manganese	CNS	9.5E-01		2.1E-01	**1.2E+00**
(Total)		**2.0E+00**		4.1E-01	**2.4E+00**
Chloroform	liver, kidney		**3.3E+02**		**3.3E+02**
(Total)			**3.3E+02**		**3.3E+02**
				Total Hazard Quotient Across Groundwater	**3.3E+02**

Total Liver/Kidney HI =	**3.3E+02**
Total CNS HI =	**1.2E+00**
Total Liver HI=	**1.2E+00**

1. Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
2. Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.
3. For total risk calculations refer to the appropriate Table 9.

304047

TABLE 10.2b - CT
RISK ASSESSMENT SUMMARY[2]
CENTRAL TENDENCY
Virgin Island Chemical Site

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Local Aquifers (Alluvium & Kingshill)	Chloroform	**3E-06**		**1E-06**	**5E-06**	Chloroform	liver	5.9E-01		2.0E-01	7.9E-01
			Arsenic	**1E-06**		1E-10	**1E-06**	Iron	liver, heart, pancreas	2.3E-01		8.7E-02	3.2E-01
								Manganese	CNS	5.5E-01		2.1E-01	7.6E-01
			(Total)	**5E-06**		**1E-06**	**6E-06**	(Total)		**1.4E+00**		4.9E-01	**1.9E+00**
	Air	Local Aquifers (Alluvium & Kingshill)	Chloroform		**2E-04**		**2E-04**	Chloroform	liver, kidney		**3.3E+02**		**3.3E+02**
			(Total)		**2E-04**		**2E-04**	(Total)			**3.3E+02**		**3.3E+02**
					Total Risk Across Groundwater		**2E-04**			Total Hazard Quotient Across Groundwater			**3.3E+02**

Total Liver/Kidney HI = **3.3E+02**
Total CNS HI = 7.6E-01
Total Liver/Heart/Pancreas HI = 3.2E-01

1. Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
2. Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.
3. For total risk calculations refer to the appropriate Table 9.
4. Since only 1 significant figure is used in presenting carcinogenic risk, variations in cumulative risk may be a result of rounding.

304048

TABLE 10.3 - RME
RISK ASSESSMENT SUMMARY[2]
REASONABLE MAXIMUM EXPOSURE
ISLAND CHEMICAL

Scenario Timeframe: Future
Receptor Population: Construction
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	(Total				

Chemical	Non-Carcinogenic Hazard Quotient				
	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Arsenic	skin	1.1E-01		4.5E-03	1.1E-01
Iron	liver/heart/pancreas	6.4E-01		NA	6.4E-01
Manganese	CNS	2.5E-01		NA	2.5E-01
(Total)	Total Hazard Index Across Surface Soil				1.0E+00
	Total Hazard Index across all media and all exposure routes				1.0E+00

1. Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
2. Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.
3. For total risk calculations refer to the appropriate Table 9.
4. NA - Not Applicable

Total Skin HI =	1.1E-01
Total Liver/Heart/Pancreas HI =	6.4E-01
Total CNS HI =	2.5E-01

304049

TABLE 10.4a - RME
RISK ASSESSMENT SUMMARY[2]
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Chloroform	**7E-05**		**3E-06**	**8E-05**	Chloroform	liver	**2.8E+00**		1.0E-01	**2.9E+00**
			Methylene chloride	**4E-06**		8E-08	**4E-06**	Iron	liver, heart, pancreas	**1.1E+00**		4.4E-02	**1.2E+00**
			Arsenic	**3E-05**		3E-10	**3E-05**	Manganese (nonfood)	CNS	**2.7E+00**		1.1E-01	**2.8E+00**
			(Total)	**1E-04**		**3E-06**	**1E-04**	(Total)		**6.6E+00**		2.5E-01	**6.9E+00**
	Air	Water Vapors Via Bathing	Chloroform		**7E-04**		**7E-04**	Chloroform	liver		**2.5E+02**		**2.5E+02**
			(Total)		**7E-04**		**7E-04**	(Total)			**2.5E+02**		**2.5E+02**
					Total Risk Across Groundwater		**8E-04**					Total Hazard Quotient Across Groundwater	**2.5E+02**

Total Liver/Kidney HI = **2.5E+02**
Total CNS HI = **2.8E+00**
Total Liver/Heart/Pancreas HI = **1.2E+00**

1 Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
2 Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented
3 For total risk calculations refer to the appropriate Table 9.

304050

TABLE 10.4b - CT
RISK ASSESSMENT SUMMARY[2]
CENTRAL TENDENCY

Scenario Timeframe	Future
Receptor Population	Resident
Receptor Age	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Chloroform	**1E-05**		3E-07	**1E-05**	Chloroform	liver	**1.7E+00**		3.2E-02	**1.7E+00**
			Arsenic	**5E-06**		3E-11	**5E-06**	Manganese (nonfood)	CNS	**1.5E+00**		3.3E-02	**1.6E+00**
			(Total)				**2E-05**	(Total)		**3.2E+00**			**3.3E+00**
	Air	Water Vapors Via Bathing	Chloroform		**7.E-05**		**7.E-05**	Chloroform	liver		**7.8E+01**		**7.8E+01**
			(Total)				**7.E-05**	(Total)			**7.8E+01**		**7.8E+01**
				Total Risk Across Groundwater			**9.E-05**		Total Hazard Quotient Across Groundwater				**8.1E+01**

Total Liver HI = **7.9E+01**
Total CNS HI = **1.6E+00**

1 Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1

2 Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.

3 For total risk calculations refer to the appropriate Table 9

304051

TABLE 10.5a - RME
RISK ASSESSMENT SUMMARY[2]
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Chloroform	4E-05		1E-06	4E-05	Chloroform	liver	8.3E+00		1.9E-01	8.5E+00
			Methylene chloride	2E-06		3E-08	2E-06	Iron	liver, heart, pancreas	3.2E+00		8.2E-02	3.3E+00
			Arsenic	2E-05		1E-10	2E-05	Manganese (nonfood)	CNS	7.7E+00		2.0E-01	7.9E+00
			(Total)	6E-05		1E-06	6E-05	(Total)		1.9E+01		4.7E-01	2.0E+01
	Air	Water Vapors Via Bathing	Chloroform		3E-04		3E-04	Chloroform	liver		5.8E+02		5.8E+02
			(Total)		3E-04		3E-04	(Total)			5.8E+02		5.8E+02
							Total Risk Across Groundwater	4E-04				Total Hazard Quotient Across Groundwater	6.0E+02

Total Liver HI = 5.9E+02
Total CNS HI = 7.9E+00
Total Liver/Heart/Pancreas HI = 3.3E+00

1 Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1

2 Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.

3 For total risk calculations refer to the appropriate Table 9

304052

TABLE 10.5b - CT
RISK ASSESSMENT SUMMARY[2]
CENTRAL TENDENCY

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Chloroform	**3E-05**		3E-07	**3E-05**	Chloroform	liver	**4.8E+00**		5.9E-02	**4.9E+00**
			Methylene chloride	**1E-06**		9E-09	**1E-06**	Iron	liver, heart, pancreas	**1.9E+00**		2.6E-02	**1.9E+00**
			Arsenic	**1E-05**		4E-11	**1E-05**	Manganese (nonfood)	CNS	**4.5E+00**		6.2E-02	**4.6E+00**
			(Total)	**4E-05**		3E-07	**4E-05**	(Total)		**1.1E+01**		1.5E-01	**1.1E+01**
	Air	Water Vapors Via Bathing	Chloroform		**1E-04**		**1E-04**	Chloroform	liver		**1.8E+02**		**1.8E+02**
			(Total)		**1E-04**		**1E-04**	(Total)			**1.8E+02**		**1.8E+02**
					Total Risk Across Groundwater		**1E-04**				Total Hazard Quotient Across Groundwater		**1.9E+02**

Total Liver HI = **1.9E+02**
Total CNS HI = **4.6E+00**
Total Liver/Heart/Pancreas HI = **1.9E+00**

1. Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
2. Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.
3. For total risk calculations refer to the appropriate Table 9.
4. NA - Not Applicable

304053

TABLE 10.6a - RME
RISK ASSESSMENT SUMMARY[1]
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult + Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Chloroform	1E-04		4E-06	1E-04						
			Methylene chloride	7E-06		1E-07	7E-06						
			Arsenic	5E-05		4E-10	5E-05		Total Hazard Quotient Across Groundwater				
			(Total)	2E-04		4E-06	2E-04						
	Air	Water Vapors Via Bathing	Chloroform		1E-03		1E-03						
			(Total)		1E-03		1E-03						
					Total Risk Across Groundwater		1E-03						

1 Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1.
2 Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.
3 For total risk calculations refer to the appropriate Table 9
4 NA - Not Applicable

304054

TABLE 10.6b - CT
RISK ASSESSMENT SUMMARY[1]
CENTRAL TENDENCY

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult + Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Chloroform	4E-05		6E-07	4E-05						
			Methylene chloride	2E-06		2E-08	2E-06						
			Arsenic	2E-05		7E-11	2E-05		Total Hazard Quotient Across Groundwater				
			(Total)	6E-05		6E-07	6E-05						
	Air	Water Vapors Via Bathing	Chloroform		2E-04		2E-04						
			(Total)		2E-04		2E-04						
					Total Risk Across Groundwater		2E-04						

1. Boldface type denotes carcinogenic risk estimates within or exceeding the 10^{-6} to 10^{-4} range or noncarcinogenic hazards exceeding 1
2. Only exposures which exceed target risk levels, or significantly contribute to carcinogenic risk or noncarcinogenic hazard for this scenario are presented.
3. For total risk calculations refer to the appropriate Table 9.
4. NA - Not Applicable

304055

K

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LIST OF ACRONYMS

AET	Apparent Effects Threshold
BG	Bethlehem Gut
BSAF	Biota-Sediment Accumulation Factor
CEC	Cation Exchange Capacity
COPECs	Chemicals of Potential Ecological Concern
CSM	Conceptual Site Model
ERL	Effects Range - Low
ERM	Effects Range – Median
FPG	Fair Plain Gut
FWS	Fish and Wildlife Service
HLA	Harding Lawson and Associates
HQ	Hazard Quotient
LEL	Lowest Effect Level
LOAEL	Lowest Observed Adverse Effects Levels
LOEC	Lowest Observed Effects Concentration
MOE	Ministry of the Environment
NOAA	National Oceanic and Atmospheric Association
NOAEL	No Observed Adverse Effects Level
NWI	National Wetland Inventory
PCBs	Polychlorinated Biphenyls
PF03A	Palustrine Forested Broad-Leaved Evergreen Temporarily Flooded
RAGS	Risk Assessment Guidance for Superfund
RG	River Gut
SERA	Screening Ecological Risk Assessment
SVOCs	Semi-volatile Organic Compounds
SEL	Severe Effects Level
SQC	Sediment Quality Criteria
SQG	Sediment Quality Guidelines
$\sum$TUs	Sum of Toxic Units
TOC	Total Organic Carbon
UCL	Upper Confidence Level
USEPA	United States Environmental Protection Agency
VIAPCO	Virgin Island Asphalt Products Company
VIDPNR	Virgin Island Department of Planning and Natural Resources
WI DNR	Wisconsin Department of Natural Resources

1.0 INTRODUCTION

A Screening Ecological Risk Assessment (SERA) was conducted for the Virgin Island Chemical Superfund Site (the Site) located in St. Croix, U.S. Virgin Islands. The SERA was completed in accordance with the USEPA approved Remedial Investigation Work Plan (Harding Lawson Associates (HLA), 1997) and the correspondence dated November 13, 1997 submitted by McLaren/Hart Inc. (McLaren/Hart) to USEPA Region II. The SERA will focus on the drainage channels adjacent and downstream of the Site including the River Gut (which serves as the northeast and southeast border of the Site), Bethlehem Gut, and Fair Plain Gut. The SERA was developed utilizing data obtained through a surface soil/sediment sampling program conducted within the three drainage channels.

The objective of the sampling program was to characterize surface soils and sediments within the drainage channels to determine the presence of site-related constituents of potential ecological concern (COPECs). The River Gut, Bethlehem Gut, and upstream areas of Fair Plain Gut only contain water during flooding conditions and do not support aquatic biota. Therefore, these intermittent drainage channels were characterized as terrestrial environments and samples collected from these locations were evaluated in this SERA as surface soils. Downstream locations in Fair Plain Gut are continuously covered with estuarine water; therefore, the samples collected at these locations were characterized as sediments.

The chemical concentrations measured in sediment and surface soil were used to evaluate the potential for adverse effects to ecological receptors inhabiting or foraging within the three drainage channels. The analytical results evaluated herein are also presented in Sections 4.1of this RI Report. The sampling locations within the River Gut, Bethlehem Gut, and Fair Plain Gut are identified in Figures 1 and 2 and described in Table 1. Sampling activities conducted in September 1997 included:

- Qualitative biological surveys of flora and fauna on the Site.

- Sediment collection and analysis for metals, polychlorinated biphenyls (PCBs), pesticides, semi-volatile organic compounds (SVOCs), total organic carbon (TOC), pH, and grain size. Samples collected in downstream portions of Fair Plain Gut (locations FPG-3 and FPG-4) were classified as sediments due to the continuous overlying surface water.

- Surface soil collection and analysis for metals, PCBs, pesticides, SVOCs, TOC, pH, and grain size. Samples collected in the River Gut (RG-2 through RG-16), Bethlehem Gut (BG-1 and BG-2), and Fair Plain Gut (FPG-1 and FPG-2) were classified as surface soils due to the absence of overlying surface water with the exception of intermittent submersion during heavy rainfall.

This SERA was structured utilizing the standard paradigm for risk assessment as outlined in the *Framework for Ecological Risk Assessments* (USEPA 1992) and the *Guidelines for Ecological Risk Assessment* (USEPA, 1998). The ecological risk assessment complies with the concepts outlined in the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA, 1997). The SERA consists of the following elements:

- Ecological Problem Formulation;
- Ecological Exposure Assessment;
- Ecological Effects Assessment; and
- Ecological Risk Characterization.

The SERA begins with a problem formulation phase that defines the potential sources, the current condition of the receiving environment, and the assessment endpoints. Then, for each endpoint, there is an analytical phase consisting of the exposure and effects assessments. The risk characterization then combines the components of the analysis phase.

2.0 ECOLOGICAL PROBLEM FORMULATION

The problem formulation section consists of the description of the relevant features and current condition of the environment, the description of the potential sources, and the identification of ecological receptors at the facility and surrounding area. This information is then summarized in the form of a conceptual model. The conceptual model presents hypothetical hazards posed by the facility-related chemicals to the endpoint biota.

2.1 ENVIRONMENTAL DESCRIPTION

The environmental description discusses the site setting and ecological characteristics at the Site and the surrounding environment. This section summarizes the water resources, ecological habitat, flora, and fauna present on the Site as summarized by HLA (1994, 1995ab), USEPA Region 2 (1996), and McLaren/Hart (observed during the site visit conducted in September 1997).

2.1.1 Site Setting

The Site occupies approximately three acres in south central St. Croix, located on Route 66, approximately 1,500 feet north of the Alexander Hamilton Airport. The Site is bordered on the northeast and southeast by the intermittent drainage channel known as the River Gut. The Site is bordered by the northwest by an asphalt batch plant (Photos 1 and 2) and to the southwest by Route 66. A concrete or cement batch plant (Photos 3 to 8) and an automobile body repair shop are located to the east of the site, across the River Gut (HLA, 1994).

This area receives drainage from approximately 6,300 acres to the northwest of the Site. Based on drainage area comparisons, the River Gut appears to receive approximately one third of that flow.

The remainder of the flow is drained by another intermittent drainage channel, the Bethlehem Gut, that joins the River Gut approximately 800 feet southeast (downstream) of the Site. Flow in the River Gut and the Bethlehem Gut is intermittent and only occurs during the rainy season between September and December (HLA, 1994). There are no permanently flowing streams which support aquatic biota on the island of St. Croix (Ogden, 1974). The River Gut (Photos 9 to 22) and the Bethlehem Gut (Photo 23) merge and flow into Fair Plain Gut (Photos 24 to 26), Manning Bay (Photo 27), and the Carribean Sea, approximately 4,500 feet to the south.

The Site and the Gut system are located within ecological areas that have been significantly impacted by human activities since the 1400's (Riveria et al., 1970; Little et al., 1974; Forman, 1974; and Ogden, 1974). Those impacts include physical disturbance, overgrazing and other poor agricultural practices, and the introduction of invasive/exotic species. The introduction of invasive or exotic species has led to uncontrolled population pressures of some of the exotic species, removal of native species from select niches, and predation pressures on food sources. Fosberg (1974) notes that of 890 seed plants found on the American Virgin Islands, 27 are considered to be endemic, and 4 are restricted to St. Croix. McManus (1974) notes that St. Croix is depauperate of mammalian species as a result of the evolutionary difficulties in colonizing islands well removed from continental land masses (Brown and Gibson, 1983). McManus further reports that no non-flying mammal were found on St. Croix prior to the arrival of Columbus. Today, the non-flying dominant mammals are introduced species, including the black rat (*Rattus rattus*), Norway rat (*Rattus norvegicus*), house mouse (*Mus musculus*), and mongoose (*Herpestes auropunctatus*). Several species of bats have been historically reported in St. Croix including the West Indian fruit bat (*Brachyphylla cavernarum*), Jamaican fruit bat (*Artibeus jamaicensis*), and the fish-eating bat (*Noctilio leporinus*).

McManus (1974) notes that whitetail deer (*Ococoileus virginiana*) where introduced onto St. Croix in the 1790's. It is thought that whitetail deer where introduced as a game animal. By the early 1970's the population was around 1000, though severe hunting pressure had made the animal secretive and restricted to more undeveloped areas of the island. McManus reports that a program

was initiated in the early 1970's to eliminate whitetail deer from the island because it serves as a reservoir for a species of infectious cattle tick.

2.1.2 Ecological Characteristics

The Site and the Gut system cross a number of ecosystem types as described by Forman (1974). The Site itself appears to be located in what would be described as a modified by man monocultural ecosystem. That is an ecosystem type that has been significantly disturbed and is dominated by a single species (though others may be present). The Gut sytems, on the other hand, contain components of a variety of ecosystem types. The upper reaches of the River Gut and the Bethlehem Gut would be classified as deciduous forest ecosystem type. This area is dominated by deciduous trees, such as gumbo-limbo (*Bursera simaruba*), which are found in relatively dry portions of the island. As a result of the significant disturbance that has historically occurred within and adjacent to the River Gut next to, and downstream of the Site, this area would also be categorized as a modified by man monocultural ecosystem.

Approximately 50 percent (1.5 acres) of the actual Site is developed and covered by buildings, concrete, and process structures. The remaining 50% of the Site is composed of a mixture of barren land (approximately 47%: 1.4 acres) and vegetated areas (approximately 3%: 0.1 acres). Most of the barren lands were created from the removal of site vegetation using excavation equipment in January 1995 to facilitate site investigation activities (HLA, 1995b).

The remaining small areas of vegetation identified on-site by HLA and McLaren/Hart were dominated by tan tan (*Leucaena glauca*), guinea grass (*Panicum maximum*), monkey-no-climb (*Ceiba petandra*), opportunistic herbaceous weed species, and planted ornamentals (e.g., mango tree [*Mangifera indica*], purple queen [*Setcreasea pallida*], kalanchoe [*Kalanchoe blossfeldiana*], limber caper [*Capparis fleuosa*], and Christmas candle [*Pedilanthus tithymaloides*]) (HLA, 1995ab). Guinea grass is the most prevalent species across the Site. Most of the vegetative areas were

observed on the eastern border of the site in the riparian zones of the River Gut. The vegetative species identified by HLA (1995ab), EPA Region II (1996), and McLaren/Hart during the September 1997 site visit are presented in Table B-1 (Attachment B).

Wetlands have been identified within the River Gut channel adjacent to the Site. The U.S. Fish and Wildlife Service (FWS), National Wetlands Inventory (NWI) mapping, identified the River Gut as a PFO3A wetland (Palustrine Forested Broad-Leaved Evergreen Temporarily Flooded) (HLA, 1995a). PFO3A wetlands are described as freshwater wetlands less than 20 acres and less than 2 meters deep at low water; forested with woody vegetation 20 feet or taller; broad-leaved evergreen vegetation; and floods most years for less than 2 weeks during the growing season, and usually dry by mid-growing season (Cowardin, 1979).

Since the River Gut is dry most of the year, it does not support an aquatic community. The River Gut was observed during several field events during 1997 and 1998, and at no time did it contain standing water adjacent to or downstream of the Site for any significant length of time following a storm event (Photos 9 to 23). The Virgin Island Department of Planning and Natural Resources (VIDPNR) occasionally regrades and reshapes the River Gut from a point just upstream of the facility to areas downstream of the Route 66 overpass. A representative of the Department of Public Works has indicated that the most recent maintenance was conducted in the spring of 1997. These activities result in significant physical disturbance of the habitat in the area. The River Gut is also impacted by hurricanes that pass through the area. The side slopes and bottom of the River Gut are uniform in shape and are covered predominantly by guinea grass. There is a corrugated iron berm placed across the River Gut, just upstream of the Route 66 overpass. This berm works to reduce water flow though the overpass.

The River Gut merges with Bethlehem Gut approximately 800 feet southeast of the Site and then flows into Fair Plain Gut. There is a natural buildup of sand deposits at the mouth of Fair Plain Gut due to the long shore currents, wind, and wave energy. The berm is approximately 0.9 meters high

and 6 meters wide and is breached only during periods of heavy rains, high seas, or sewage overflows. Otherwise, this berm blocks the flow of water from Fair Plain Gut to Manning Bay. Despite the presence of the berm, Region 2 biologists have reported numerous fish in the hypersaline portions of the gut. Approximately 0.5 acres of mangrove habitat near the Alexander Hamilton Airport have been bulldozed, including 107 meters along the Fair Plain Gut (USEPA, 1996).

The permanently inundated sections of the Fair Plain Gut would be categorized as a mangrove swamp ecosystem type (Photo 26), which constitutes the most ecologically diverse and important of the ecosytem types through which the drainage system flows. The ecosystem type in the Fair Plain Gut is dominated by red mangrove (*Rhizophora mangle*), button-mangrove (*Conocarpus erectus*), and acacia (*Acacia tortuosa*) which provides dense cover within the riparian zone for juvenile fish and turtles. Some black mangrove (*Avicennia nitida*) and white mangrove (*Languncularia racemosa*) are also present.

It is important to note that the berm crossing the mouth of the Fair Plain Gut restricts normal tidal/surface flow into and out of the Fair Plain Gut. While the berm is occasionally breached through severe storm actions, the berm confines water within the Fair Plain Gut and isolates it from Manning Bay and the Carribean Sea. As a result of this isolation, the normal tendency of the open water area of the Fair Plain Gut would be to develop hypersaline conditions. Sediments in hypersaline areas such as the Fair Plain Gut are often mucky and anoxic, particularly around vegetation. Salt concentrations can range between 60 and 150 parts per thousand. While the Fair Plain Gut may encompass a mangrove swamp, it passes through littoral woodland, savanna, and beach ecosystem types.

Fair Plain Gut flows into Manning Bay which is a marine environment with a predominantly sandy substrate. Sea grasses and scattered rubble are present toward the reef approximately 1.2 km offshore. Habitat conditions appear to support a complex fish and invertebrate community. The faunal species which were identified by Philbosian and Yntema (1977), HLA (1995ab), EPA Region

II (1996), and McLaren/Hart during the September 1997 site visit are presented in Table B-2 (Attachment B).

2.2 ASSESSMENT AND MEASUREMENT ENDPOINTS

Ecological assessment endpoints represent the environmental attributes or characteristics to be protected. The assessment endpoints selected for this SERA included the evaluation of the reduction of species richness and diversity of the following communities on the Site resulting from toxicity.

- Plant community in the guts
- Herbivorous wildlife communities (e.g., goats and Jamaican fruit bats [*Artibeus jamaicensis*]) inhabiting the guts
- Insectivorous wildlife communities (e.g., spotted sandpiper [*Actitis macularia*] inhabiting the guts
- Benthic macroinvertebrate community in Fair Plain Gut
- Piscivorous wildlife (e.g., great blue heron [*Ardea herodias*]) community in Fair Plain Gut

The above assessment endpoints generally can not be measured directly, measurement endpoints were identified. This assessment had up to two lines of evidence potentially available to serve as measurement endpoints: 1) *ecotoxicological benchmarks* (all endpoint communities) derived from chemical toxicity data from the literature to determine the potential for ecological effects, and 2) *qualitative biological survey data* (floral and faunal communities) which are direct estimates of the assessment endpoint. The specific measurement endpoints used for each assessment endpoint in this SERA are described below.

2.2.1 Plant Community

Chemical Toxicity Data: To evaluate potential risks to the terrestrial plant community on the Site, the chemical concentrations detected in surface soil were compared to phytotoxicity benchmarks. Phytotoxicity benchmarks, compiled from the open literature, represent chronic toxicity thresholds for growth or production of vascular plants for chemicals in soil (Efroymson et al., 1997). These test endpoints are assumed to correspond to the assessment endpoint for this community. That is, the sensitivity distribution of the test species is assumed to approximate the distribution of species that would be present on the Site. Exceedance of the test endpoints is assumed to correspond to 20% reductions in abundance or productivity, with some uncertainty.

Biological Surveys: Vegetation surveys were conducted on the Site during September 1997. These surveys consisted of a qualitative evaluation of species composition and diversity and the presence of visible plant stress.

2.2.2 Benthic Macroinvertebrate Community

Chemical Toxicity Data: Due to the presence of saline waters, chemical concentrations measured in sediment collected from Fair Plain Gut were compared to National Oceanic and Atmospheric Association (NOAA) Effects Range-Low (ERL) and Effects Range-Median (ERM) values (Long et al., 1995). If ERLs and ERMs were unavailable, Ontario Ministry of the Environment (MOE) Lowest Effects Levels (LELs) and Severe Effects Levels (SELs) (Persaud et al., 1993), Apparent Effects Thresholds (AET) (Fitchko, 1987), or Wisconsin Department of Natural Resources Sediment Quality Criteria (WI DNR SQC) (Geisy and Hoke, 1990) were used for the screening process. Chemical concentrations in excess of these screening benchmarks were identified as COPECs and may potentially impact benthic macroinvertebrates inhabiting the location.

As per EPA and NOAA's request, a supplemental evaluation was also conducted for surface soils collected within the River Gut, Bethlehem Gut, and upstream Fair Plain Gut. The chemical concentrations measured in soil were compared to sediment screening benchmarks (MOE LELs and SELs) to identify the potential for impacts to macroinvertebrate communities which may be established in the future during prolonged periods of surface water inundation.

2.2.3 Herbivorous Wildlife

Chemical Toxicity Data: To evaluate the potential risks to herbivorous wildlife, domesticated goats (a common resident near the Site: Photo 28) and the Jamaican fruit bat were selected as representative species for this trophic level. While goats are a domesticated species, they are the major herbivore in the River Gut adjacent to the Site. Large numbers were seen during the September 1997 site visit. As such, it was considered neccessary to include these animals in this assessment in order understand the potential for impacts to a grazing animal, especially in light of the lack of native herbivorous mammals on St. Croix.

From an ecological standpoint, the fruit bat is the only native herbivorous resident of the island (McManus, 1974 and Bill Knowles, VIDPNR, personal communication, 1998). Trees bearing fruit that constitutes the diet of the fruit bat were found infrequently in the vicinity of the Site, though several fruit bat specimens were observed roosting in the abandoned laboratory building during the September 1997 Site visit.

Point estimates of exposure were calculated from the ingestion of plants and surface soil at each location. Chemical concentrations in plants were estimated using soil-plant uptake factors (Baes et al., 1984 and Sample et al., 1997) and the chemical concentration measured in surface soil from each location. The total exposure estimate was then compared to literature-derived ecotoxicological benchmarks. Chronic No Observed Adverse Effects Levels (NOAELs) and Lowest Observed Adverse Effects Levels (LOAELs) were derived using chronic toxicity thresholds from mammalian

toxicity tests. Greater weight was given to data from long-term feeding studies which included reproductive endpoints.

2.2.4 Insectivorous Wildlife

To evaluate the potential risks to insectivorous wildlife within the guts, spotted sandpipers were selected as a representative species for this trophic level. Spotted sandpipers are a common migrant in St. Croix and are known to feed on invertebrates along beaches and lagoons. Concentrations in aquatic and terrestrial benthic macroinvertebrates were predicted using soil-to-worm uptake factors or simple regression models (Sample et. al., 1997) and the chemical concentrations measured in surface soil or sediment from each location. The total exposure estimate was then compared to literature-derived ecotoxicological benchmarks as described in Section 2.3.3.

2.2.5 Piscivorous Wildlife

Chemical Toxicity Data: To evaluate the potential risks to piscivorous wildlife foraging in Fair Plain Gut, great blue herons were selected as a representative species for this trophic level. Inorganic biota-sediment accumulation factors (BSAFs) for fish are not available. Therefore, concentrations in forage fish were predicted using soil-to-worm uptake factors or simple regression models (Sample et. al., 1997) and the chemical concentrations measured in sediment within Fair Plain Gut. Predicted concentrations in fish are further discussed in Section 4.1.3. The total exposure estimate was then compared to literature-derived ecotoxicological benchmarks as described in Section 2.3.3

2.3 Conceptual Site Model

The conceptual site model (CSM) describes the hypothesized source of COPECs, routes of exposure and transport, and ecological receptors. At the Site, previous tenants (including Caribe Chemical Company, Pierrel International S.A., Cooper Laboratories, and Berlex Laboratories, Inc.) produced

and/or disposed of pyridine, acids, solvents, benzyl chloride, benzyl salicylate, phenacetin, ethoxyquin, quinine, quinidine, or toluene. The CSM, presented in Figure 3, illustrates the potential migration of chemical constituents into the environment as a result of overland runoff, stormwater (through storm drains) runoff, and ground water flow from the Site and/or surrounding industrial facilities.

Several industries may be potential contributors of COPECs subsequently transported to downstream portions of the River Gut. Meridan Engineering (also known as Virgin Island Asphalt Products Company [VIAPCO]), an asphalt mixing plant (Photos 1 and 2), and Virgin Island Paving Company (Photos 29 to 30) are all located upstream of the Site. Charlies Concrete Company (Photos 3 to 8) is located directly across the River Gut from the Site. Several oily seeps were identified in the River Gut (near RG-10) adjacent to the concrete company (Photos 31 to 33) during the site visit. Downstream of the Site, the River Gut is bordered by Melvin Evans Highway (Route 66) to the south and Charlies Concrete Company to the north. Several hundred feet downstream of Charlie's Concrete Company, the River Gut forms a confluence with the Bethlehem Gut to form the Fairplain Gut. There are two to three foot high strips of metal sheeting placed in the ground at the confluence of the River and Bethlehem Guts. In addition, trash (e.g., tires, household trash, beverage cans, etc.) from the roadways (East Airport Road and Melvin Highway) was visible at the confluence. Zenon Construction, a gas station, a wastewater treatment plant, and St. Croix Sanitary Landfill may also release constituents to Fair Plain Gut or Manning Bay.

Historical concentrations of metals measured in the surface soils collected during 1986 in the River Gut and storm drains are presented in Table 2. Aluminum, arsenic, barium, chromium, cobalt, copper, lead, magnesium, manganese, nickel, vanadium, and zinc were detected in sediments or soils in the gut and/or the on-site laboratory/storm drains. The metal concentrations in the on-site laboratory or storm drains were higher or similar to concentrations measured in the River Gut in 1997. Based on this information, the on-site drains may have been a historical source to the River Gut in 1986. However, many metal concentrations measured in 1986 were similar to that detected at the reference location (RG-2) in the River Gut during 1997.

The metal concentrations measured in the soils and sediments in the drainage channels collected during 1997 were generally variable throughout the gut system. The distribution of the major chemical constituents of concern (e.g., aluminum, chromium, vanadium, and zinc: as determined in this SERA) within the drainage channels are presented in Figures 4 and 5. These distributions illustrate the contributions into the channels from upstream and surrounding (i.e., Bethlehem Gut) sources. The highest concentrations of all chemical constituents were observed at the upstream reference location (RG-2). There was also an increase in the aluminum, manganese, and zinc concentrations at locations RG-9 and RG-13 within the River Gut and location BG-1 (aluminum and manganese) in the Bethlehem Gut. The elevated concentrations in the River Gut were likely a result of the depositional nature of the location (see Table 1). However, the central storm drain which discharges near RG-12 contained elevated concentrations of manganese and zinc (595 mg/kg and 346 mg/kg, respectively) (Table 3).

The chemical constituents may be transported from upstream sources and/or the Site during rain events through the drainage channels and overland flow. Constituents suspended within water may settle within the channels subsequently composing the surface soils or sediments (downstream in Fair Plain Gut). COPECs in sediments within Fair Plain Gut, could potentially effect fish, invertebrates, plants, and wildlife through exposure mechanisms including direct contact and ingestion.

Benthic invertebrates are directly exposed to chemicals in the sediments and may result in accumulation within the tissue of the organism. The chemicals may bioaccumulate up the food chain through aquatic biota (i.e., fish, frogs or invertebrates) to waterfowl or terrestrial predators from the consumption of contaminated prey. Constituents in surface soils may bioaccumulate in vegetation and be further transported within the food chain. The food web may transfer COPECs taken up by these routes to higher order predators (e.g., herbivores, piscivores, insectivores).

Chemical constituents within surface soil and sediment will also be transported to downstream locations within the drainage channels. As discussed in Section 2.1.2, the VIDPNR occasionally

regrades and reshapes the drainage channels at a point just upstream of the facility to areas downstream of the Route 66 overpass. A representative of the Department of Public Works has indicated that the most recent maintenance was conducted in the spring of 1997.

2.4 ORGANIZATION OF THE SERA

The potential risks from constituents to each of the ecological assessment endpoints in the current baseline condition were assessed separately (Sections 3 to 5). The supplemental evaluation (see Sections 2.2.2) of the surface soils within the River Gut, Bethlehem Gut, and upstream Fair Plain Gut is presented in Section 6. Each section includes an exposure assessment, effects assessment, and risk characterization. The components of the assessment are explained below.

The exposure assessment characterizes the distribution in space and time of the concentrations of chemicals to which organisms are exposed. This section describes the modes of potential exposure that can occur for the selected assessment endpoints, describes how exposure is estimated, and presents the exposure data available for the SERA.

Effects assessment characterizes the relationship between chemicals identified during the investigative sampling and ecological receptors (assessment and measurement endpoints). The principal lines of evidence used in this SERA concerning effects are biological survey data that indicate the actual state of the receiving environment and chemical toxicity data which indicate the potential toxic effects of concentrations measured in the media. Data collected by McLaren/Hart in September 1997 and historical data collected by HLA in 1986 are presented in this SERA.

Risk characterization is the phase of risk assessment in which the information concerning exposure and the information concerning potential effects of exposure are integrated to estimate risks (the likelihood of effects given the exposure) or potential impacts. Risk characterization in ecological risk assessment is performed by a weight-of-evidence analysis. Procedurally, the risk characterization in

this assessment is performed for each assessment endpoint by (1) screening measured chemical concentrations to ecotoxicological benchmarks, (2) estimating the effects of the COPECs retained by the screening analysis, (3) estimating the effects of exposure on the endpoint biota based on the results of the biological survey data, (4) logically integrating the evidence to characterize risks to the endpoint, and (5) listing and discussing the uncertainties in the assessment.

3.0 RISKS TO THE PLANT COMMUNITY

This section presents the exposure assessment, effects assessment, and evaluation of risks to the plant community from chemicals measured in the River Gut, Bethlehem Gut, and Fair Plain Gut.

3.1 EXPOSURE ASSESSMENT FOR PLANTS

The main exposure route for plants is the uptake of chemicals from the soil through the roots. This may occur in a passive mode as the plant takes up water for respiration or by active uptake mechanisms. Another potential route of exposure is through association of chemicals with airborne soil particles (dust). The concentrations of metals measured in soils of each location are derived from double acid-extractions (nitric and hydrochloric). This concentration generally represents the total potential reservoir of chemicals in the soil. Plants are never exposed to the total amount of chemical constituents in the soil. Instead, the plants are exposed only to the soluble fraction of chemicals in the soil. The fraction of soluble constituents in the soil is determined by the characteristic of the chemical (i.e., speciation, solubility) and the characteristics of the soil (i.e., pH, cation exchange capacity (CEC), grain size, organic carbon content, etc.). The concentration of each chemical detected in surface soils at the sampling locations were used as the exposure concentration for plants in this assessment (Tables C-1 through C-3; Attachment C).

3.2 ECOLOGICAL EFFECTS ASSESSMENT FOR PLANTS

The effects assessment for the plant community includes a description of the phytotoxicological benchmarks used for the screening process and an evaluation of the vegetative surveys. The vegetative survey results indicate the actual status of the community in the drainage channels at the Site.

3.2.1 Phytotoxicological Benchmarks

To determine if the chemical concentrations measured in surface soils may be toxic to the plant community at each location, the concentrations were compared to Lowest Observed Effects Concentrations (LOECs) as determined in laboratory phytotoxicity studies (Efroymson, 1997). The soil screening benchmarks are based on data provided by toxicity studies in the field or more commonly in greenhouse and growth chamber settings. These studies evaluated the effects of chemicals on various trees, wildflowers, grasses, and vegetable species. The plants were exposed to a variety of concentrations, soil types (with differing physicochemical properties), and exposure periods. Measurement endpoints common to the phytotoxicity tests included growth and yield parameters which represent a greater than 20% adverse effect. Growth and yield measurements are direct estimates of the potential impacts to the plant community.

3.2.2 Biological Survey

Vegetative surveys were conducted in September 1997 in the three drainage channels and surrounding areas of the Site. Based on a review of the available literature, the vegetative surveys determined that the site and the guts are vegetated with species considered typipcal for the setting. There was no obvious indication of phytotoxicological stress, loss of vigor, wilting, chlorosis, or other discoloration. The only significant impacts that were observed were physically induced, the result of extensive grading within the River Gut and construction activities onsite.

3.3 Risk Characterization for Plants

Potential ecological risks were evaluated for vegetative communities inhabiting each location in the drainage channels. Two lines of evidence, screening chemicals in soil against phytotoxicological benchmarks and biological surveys, were evaluated to identify potential impacts. This evaluation is presented in the following sections.

3.3.1 Screening Soil Chemical Constituents for Potential Risks To Plants

Chemicals detected in surface soils were evaluated for their potential toxicity to plants inhabiting each location. Two risk characterization techniques were used in the evaluation of surface soils and plants. These two techniques were the calculation of hazard quotients (HQs) and the calculation and plotting of the sum of toxic units ($\sum$TUs). The chemical concentrations measured in soil samples were compared to the phytoxicological benchmarks described in Section 3.2.1 HQs were calculated using the following equation:

$$\text{Hazard Quotient} = \frac{\text{Chemical Concentration in Surface Soil}}{\text{Phytotoxicological Benchmark}}$$

If the HQ is less than or equal to 1, then the probability of adverse ecological impacts to terrestrial plants from the chemical exposure is negligible. HQs greater than one indicate that a chemical is a COPEC and may potentially produce adverse ecological impacts to vegetation. Tables C-1 to C-3 indicate that several chemical concentrations exceeded the phytotoxicity benchmarks and were identified as COPECs for plants in each of the drainage channels. The COPECs identified in the River Gut were found throughout the gut and were likely transported from the upstream reference location. The following chemicals were identified as COPECs (italics represents COPECs identified at background locations):

- **River Gut**: *aluminum, chromium, manganese*, mercury, *vanadium, and zinc*;
- **Bethlehem Gut**: *aluminum, chromium, manganese, vanadium*, and *zinc*; and
- **Fair Plain Gut**: *aluminum, chromium,* selenium, and *vanadium*.

After screening against phytotoxicity benchmarks, total toxicity at each location was evaluated using the sum of toxic units technique. This technique is used for comparative purposes and shows the relative contributions of multiple chemicals to the total toxicity at each location. Since the relative

contribution to toxicity of each COPEC is a function of its potential toxicity rather than the actual chemical concentration present at each location, toxicity normalized concentrations (or toxic units, TUs) were calculated.

TUs are quotients of the exposure of the chemical in the soil to plants divided by the benchmark. The height of the plot represents the sum of all the toxicity normalized concentrations (or $\sum$TUs: unitless) contributing to more than 5 % of the total toxicity (i.e. $\sum$TU) at each location. Even if the HQ < 1 for a chemical, the chemical was included as a COPEC if it contributed greater than or equal to 5 % of the total $\sum$TUs. The sum of the toxicity normalized concentrations is assumed to estimate the absolute toxicity of soils at the location. Assuming 100% bioavailability, if the $\sum$TU equals or exceeds 1, and all chemicals have the same mode of action, the endpoint effect is likely (i.e., potential impact on germination or growth). This is a conservative assumption for heterogenous chemical mixtures since combined toxic effects of chemicals in environmental samples have been found to be additive or less than additive (Alabaster and Lloyd, 1982).

This technique also illustrates the distribution of the COPECs within the River Gut. Figure 6 also indicates the COPECs throughout the River Gut are similar and contribute equally to potential impacts to plants from the reference location (RG-2) to the downstream location (RG-16). Bethlehem Gut (BG-1) also appears to contribute to potential impacts from aluminum in the drainage channel. Therefore, it is evident that the COPECs are likely from upgradient or surrounding sources. Furthermore, the maximum concentrations of the COPECs detected in the gut system were generally below 2X the average background concentrations measured on-site. Although, concentrations of mercury and/or selenium detected at locations RG-4, RG-5, RG-9, RG-10, RG-11, RG-13 and FPG-1 were slightly higher than 2X the average background concentration measured in on-site surface soils (See Table 4-1, Section 4 in the RI Report).

The potential phytotoxicological responses which may occur in the plant communities from these COPECs would be influenced by the physicochemical properties of the surface soil. The

bioavailability of the COPECs and thus potential impacts are highly dependent on the pH, TOC, grain size, oxidation reduction potential (Eh) of the soil in the channels (Table 4).

Decreased mobility and thus decreased bioavailability of the metals may be due to a strong adsorption to particulate matter in the channels. Elevated organic matter (TOC = 0.99% to 4.95%), neutral-alkaline pH (pH= 7.95 to 12.1), high oxidation conditions (Eh= 26.3 to 207), and high CEC (70.1 to 1920 umhos), reduces the solubility and thus the bioavailability of the metals (Herrero and Martin, 1993; Sanders et al., 1986; and Xian and Shokohifard, 1989). Therefore, potential impacts to plants inhabiting the area would be greatly reduced due to these physicochemical properties of the surface soil.

3.3.2 Biological Surveys

As discussed in Section 3.2.2, vegetative surveys conducted in September 1997 indicated that the presence of constituents of concern in surface soil was not a limiting factor to the growth and distribution of plant species around the Site. Further, no obvious indications of phytotoxicity were observed. Physical disturbance through clearing and construction appears to be a large contributor to community alteration.

3.3.3 Weight of Evidence Summary

Several non-site related COPECs were identified in surface soils at each location in the drainage channels during the chemical screening process (Section 3.3.1). Because the highest concentrations were measured at the upstream reference location (RG-2), an upstream source of metals is evident. These chemical constituents, as identified in laboratory toxicity tests, have the potential to cause adverse impacts, such as a reduction in seedling establishment, shoot growth, root/shoot/stem weight, or general plant growth, to various plant species. As such, there is the potential that chronic effects

may be possible for plants inhabiting these locations, though obvious indications of these effects were not present.

These potential chronic impacts were not detected during the site visit conducted in 1997. The results of the vegetation surveys did not indicate visible acute adverse impacts to the plants (Section 3.3.2). Based solely on the chemical concentrations in the soil, plants inhabiting the drainage channels would be hypothetically smaller in size than similar species in non-impacted areas. However, these impacts may be mitigated due to the likely reduction in metal bioavailability as discussed in Section 3.3.1. Additionally, the maximum concentrations of the COPECs (with the exception of mercury and selenium) detected in the gut system were below 2X the average background concentrations measured on-site.

Furthermore, the plants inhabiting these drainage channels are more likely affected by the regrading and reshaping maintenance activities conducted in the spring of 1997. The vegetative species found growing in the bottom of the channel and along the sides are typical of a physically disturbed environment in the Caribbean. The uniform environment consisting of short vegetation was a result of recent mowing and regrading activities. The continual physical disturbance at these locations results in this uniform environment from the Site to the Route 66 overpass.

3.3.4 Uncertainties Concerning Risks to Plants

The uncertainties associated with the evaluation of risks to plants are identified below.

- **Bioavailability of Chemicals.** It was assumed that 100% of the chemical concentration reported in surface soils was bioavailable. The double acid extraction method used to determine the soil concentrations reflect the total potential pool of chemicals. The bioavailability of these chemicals would likely be reduced based upon the chemical (e.g., pH, organic carbon) and physical (e.g., clay, moisture content) nature of the soil. Therefore,

exposure estimates based upon the chemical concentrations in soil are highly conservative and are likely to overestimate the actual chemical exposure experienced.

- **Single Chemical Tests vs Exposure to Multiple Chemicals in the Field**. While plants are potentially exposed to multiple chemicals concurrently, published toxicological values only consider effects experienced by exposures to single chemicals. Because some chemicals can interact antagonistically, single chemical studies may overestimate their toxic potential. Similarly, for those chemicals that interact synergistically, single chemical studies may underestimate their toxic potential.

- **Inorganic Constituents or Species in the Environment**. Toxicity of metal species varies dramatically depending upon the valence state or form (organic or inorganic) of the metal. For example, arsenic III is more toxic than arsenic V. The available data on the chemical concentrations in media do not report which species or form of chemical was observed. Because benchmarks used for comparison represented the more toxic species, if the less toxic species/form of the metal was actually present in soil, potential toxicity at the site may be overestimated.

4.0 RISKS TO WILDLIFE

This section presents the evaluation of risks to herbivorous, insectivorous, and piscivorous wildlife from chemical constituents measured in surface soil or sediment. Chemical concentrations in vegetation, invertebrates, or fish were predicted to estimate potential impacts to the above trophic levels.

4.1 EXPOSURE ASSESSMENT FOR WILDLIFE

Wildlife may be exposed to chemicals through dermal contact with water, soil, or through ingestion of water or food. However, since there are no conceptual models to estimate dermal contact, only dietary exposure was assessed. The total oral exposure experienced by an individual is the sum of exposures attributable to each source and may be described as:

$$E_{total} \approx E_{food} + E_{water} + E_{soil}$$

Where:

E_{total} = total exposure from all pathways

E_{food} = exposure from food consumption

E_{water} = exposure from water

E_{soil} = exposure from incidental soil consumption

For exposure estimates to be useful in the assessment of risks to wildlife, exposures must be expressed in terms of body weight-normalized daily dose or mg contaminant per kg body weight per day (mg/kg/d). Exposure estimates expressed in this manner may then be compared with toxicological benchmarks for wildlife or to doses reported in the toxicological literature.

Estimation of the daily dose an individual may receive from a particular medium for a particular chemical may be calculated using the following equation:

$$E_j = \sum_{I=1}^{m} \frac{(IR_i \times C_{ij} \times DW:WW)}{BW}$$

Where:

E_j	=	total exposure to chemical (j) (mg/kg/d)
m	=	total number of ingested media (e.g., food and soil)
IR_j	=	consumption rate for medium (I) (kg/d or L/d)
C_{ij}	=	concentration of chemical (j) in medium (I) (mg/kg or mg/L)
BW	=	body weight of endpoint species (kg).
DW:WW	=	dry-weight-to-wet-weight conversion factor (kg organism/media dry weight per kg organism/media wet weight).

Exposure estimates were calculated for all chemicals detected at each location in the drainage channels. In addition, due to the mobility of wildlife, their exposure is best represented by the mean chemical concentration in media. To be conservative, the 95% upper confidence level (UCL) was used for the exposure estimates. Therefore, the 95% UCL on the mean (in the River Gut) or the mean (if only 2 locations sampled as in the Bethlehem Gut or Fair Plain Gut) chemical concentration was also used in the exposure estimates. If the chemical was not detected at a location, one half the detection limit was used for the calculation of the summary statistic.

Because the River Gut contains surface water only during storm events, exposure to constituents in surface water was not assessed in this SERA. Furthermore, the River Gut was dry during the sampling events.

4.1.1 Herbivorous Wildlife

Chemical concentrations in soil and vegetation are needed to estimate exposure to herbivorous wildlife inhabiting the guts. The surface soil concentration was used to calculate incidental ingestion of soil for the endpoint species. The surface soil samples which were used in the calculations were collected at a depth ranging from 0 to 6 inches. Chemicals which were not detected or do not have associated wildlife ecotoxicological benchmarks could not be evaluated.

Chemical concentrations in vegetation at each location were estimated using the soil concentration and the soil-plant uptake factors or simple regression models (Table C-4). Regression models were used for predicting arsenic, cadmium, nickel, and selenium concentrations in plants (Sample et al., 1997). Soil-plant uptake factors for inorganic constituents were derived by Sample et al., 1997 or Baes et al. (1984). These uptake factors and regression models are in mg/kg dry weight. Therefore, the predicted concentrations in vegetation must be converted to mg/kg wet weight using a dry-weight-to-wet-weight (DW:WW) conversion factor (kg organism dry weight per kg organism wet weight). The DW:WW conversion factor was also applied to calculate the wet weight concentration measured in the soil. The average moisture content measured in the soils collected from each drainage channel was applied to calculate incidental soil ingestion exposure.

To estimate exposure potentially experienced by domestic goats, the following assumptions were made:

- Average Body weight =34.5 kg (Wigal and Coggins 1990).;
- Food consumption rate = 0.9072 kg/d (Huston, 1992) (conservative estimate for an adult buck);
- Soil consumption = no literature available for goats. However, soil consumption assumed to be similar to cattle and sheep which consume a diet of 18% soil if sparse vegetation is present. If lush vegetation is present, only 1 to 2 % of soil is consumed (Beyer et al., 1994). To be

conservative, an incidental soil consumption rate of 0.16329 kg/d (18%) was used during the screening process.

- Diet consists of 100% vegetation: grasses, forbes and browse (shrubs, woody plants, weeds, and briars (Adams et al., 1992).
- DW:WW conversion factor = 0.18 kg plant dry weight per kg plant wet weight or 82% moisture (Salisbury and Ross, 1992).

To estimate exposure potentially experienced by Jamaican fruit bats, the following assumptions were made:

- Average Body weight = 0.05 kg (Janzen, 1983);
- Food consumption rate = 0.04 kg/d (allometric equation= $(0.0582 \times BW^{0.651})/ 0.2$ [Nagy, 1987]);
- Soil consumption = since the fruit bat is an arboreal feeder, foraging primarily on the fruits of trees (Gardner, 1977), the soil consumption is assumed to be negligible;
- Diet consists of 100% fruits and seeds (Gardner, 1997), these concentrations are assumed to be equivalent to other vegetation.
- DW:WW conversion factor = 0.23 kg fruit dry weight per kg fruit wet weight or 77% moisture for fruits (USEPA, 1993).

Using the above equation, and the assumptions and data described above, exposure to chemicals were estimated for the goat and bats for each location in the River (Table C-4 and C-7), Bethlehem (Table C-5 and C-8), and Fair Plain (Table C-6 and C-9) Guts.

4.1.2 Insectivorous Wildlife

Chemical concentrations in soil and invertebrates are needed to estimate exposure to insectivorous wildlife (e.g., spotted sandpiper). Earthworms are considered to be representative of soil

invertebrates or terrestrial detritovores. They constitute a large fraction of the biomass of soil invertebrates and earthworms appear to be more highly exposed to soil contaminants than other soil and litter invertebrates (Davis and French, 1969; Ma, 1994). Chemical concentrations in earthworms at each sampling location were estimated using the soil concentration and the soil-to-worm uptake factors or regression models (Sample et al., 1997). Soil-to-worm uptake factors or regression models are only available for arsenic, cadmium, chromium, copper, mercury, manganese, nickel, lead, and zinc. If uptake factors were unavailable for the chemical, an uptake factor was conservatively assumed to be equal to one. Concentrations predicted in earthworms were also conservatively assumed to be similar to that predicted in other invertebrates composing the sandpiper's diet. A DW:WW conversion factor was also applied to the predicted earthworm concentration prior to exposure estimation.

To estimate exposure potentially experienced by the sandpiper, the following assumptions were made:

- Average Body weight = 0.040 kg (average weight reported in PA; Dunning, 1984).
- Food consumption rate = 0.036 kg/d (allometric equation using average body weight [0.0582 x $BW^{0.651}$ / 0.2] (Nagy, 1987));
- Soil consumption = 0.006kg/d (18% of diet; Beyer et al., 1994);
- Diet consists primarily of terrestrial and aquatic insects (Bent, 1929). However, they may also consume crustaceans, leeches, molluscs, small fish, and carrion (Oring et al., 1983). The sandpiper's diet was assumed to be 100% benthic invertebrates.
- DW:WW conversion factor = 0.16 kg soil invertebrate dry weight per kg soil invertebrate wet weight or 84% moisture (USEPA, 1993).

Using the above equation, and the assumptions and data described above, exposure to chemicals were estimated for the spotted sandpiper for each location in the River (Table C-10), Bethlehem (Table C-11), and Fair Plain (Table C-12) Guts.

4.1.3 Piscivorous Wildlife

At the request of NOAA and USEPA, the great blue heron was selected as a representative piscivorous species foraging in Fair Plain Gut. It must be noted that this evaluation is highly uncertain due to the absence of data (e.g., chemical concentrations in surface water and fish) necessary to accurately model exposure to the receptor. For this assessment, chemical concentrations measured in sediment collected in Fair Plain Gut were used to predict concentrations in forage fish. As mentioned in Section 2.2.4, inorganic BSAFs for fish are not available. Therefore, concentrations in forage fish were predicted using soil-to-worm uptake factors or simple regression models (Sample et. al., 1997 and 1998). If an uptake factor was unavailable, the uptake factor was conservatively assumed to be equal to one. A DW:WW conversion factor was applied to the predicted fish concentrations prior to exposure estimation. The use of the soil-to-worm uptake factor or regression models for these calculations will likely yield a conservative overestimate of exposure to herons foraging in the area.

To estimate chemical exposure potentially experienced by the great blue heron, the following assumptions were made:

- Average Body weight = 2.3 kg (average of adult males and females; USEPA, 1993).
- Food consumption = 0.4 kg/d (USEPA, 1993).
- Sediment consumption = as a piscivore, assumed to be negligible (Sample and Suter, 1994).
- Diet conservatively assumed to consist of 100% fish (USEPA, 1993).
- DW:WW conversion factor = 0.25 kg fish dry weight per kg fish wet weight or 75% moisture (USEPA, 1993).

According to USEPA (1993), fish are the preferred prey of the great blue heron, however they also consume other aquatic species, insects, birds, and mammals. For the purpose of this assessment, it was assumed that 100 percent of the diet was comprised of fish associated with Fair Plain Gut. Using

the equation described in Section 4.1, and the assumptions and data described above, exposure to all chemicals detected in media were conservatively estimated for the great blue heron (Table C-13).

4.2 Ecological Effects Assessment for Wildlife

To determine if the chemical exposure experienced by herbivorous, insectivorous and piscivorous wildlife from foraging in the drainage channels could produce adverse effects, exposure estimates from Section 4.1 were compared to No Observed Adverse Effects Levels (NOAELs) and Lowest Observed Adverse Effects Levels (LOAELs) derived according to the methods outlined by Sample et al., (1996) and USEPA (1993). NOAELs represent the highest exposure at which no adverse effects were observed among the animals tested. LOAELs represent the lowest exposure at which significant adverse effects are observed.

Toxicological studies of the effects of chemicals observed at each location were obtained from the open literature. Studies of the effects of long-term, chronic oral exposures, whether in food, water, or by oral intubation, were used. To make the NOAELs and LOAELs relevant to possible population effects, preference was given to studies that evaluated effects on reproductive parameters. In the absence of a reproduction endpoint, studies that considered effects on growth, survival, and longevity were used.

Smaller mammals have higher metabolic rates and are usually more resistant to toxic chemicals because of more rapid rates of detoxification. It has been shown that metabolism is proportional to body surface area which, for lack of direct measurements, can be expressed in terms of body weight (bw) raised to the 3/4 power ($bw^{3/4}$) (Travis and White, 1988; Travis et al., 1990; and USEPA, 1992b). If the dose (d) itself has been calculated in terms of unit body weight (i.e., mg/kg), then the dose per unit body surface area (D) equates to:

$$D = \frac{d \times bw}{bw^{3/4}} = d \times bw^{1/4}$$

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The assumption is that the effective dose per body surface area for species "a" and "b" would be equivalent. Therefore, knowing the body weights of two species and the dose (d_b) producing a given effect in species "b," the dose (d_a) producing the same effect in species "a" can be determined. Using this approach, if a NOAEL was available for the test species ($NOAEL_t$) (i.e., a rodent), the equivalent NOAEL for a wildlife species ($NOAEL_w$) (i.e., the goat and bat) was calculated by using the adjustment factor for differences in body size:

$$NOAEL_w = NOAEL_t \left\{ \frac{bw_t}{bw_w} \right\}^{1/4}$$

This methodology is equivalent to the USEPA's approach in their carcinogenicity assessments and Reportable Quantity documents for adjusting from animal data to an equivalent human dose. For avian species (e.g., spotted sandpipers and herons), the dose was not adjusted for body scaling.

In cases where a NOAEL for a specific chemical was not available, but a LOAEL had been determined experimentally or where the NOAEL was from a subchronic study, the chronic NOAEL was estimated. USEPA (1993) suggests the use of uncertainty factors of 1 to 10 for subchronic to chronic NOAEL and LOAEL to NOAEL estimation. Because no data were available to suggest the use of lower values, uncertainty factors of 10 were used in all instances in which they were required. The NOAEL and LOAEL benchmarks and the toxicological studies that were used to derive them are presented in Table 5.

4.3 Risk Characterization for Wildlife

Only one line of evidence, chemical toxicity data, was available for the assessment of risks to each wildlife trophic level. The evaluation of risks to each representative (e.g., mice, goats, spotted sandpipers, and great blue herons) from the consumption of soil/sediment, vegetation, invertebrates, and/or fish are discussed in the following sections.

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4.3.1 Screening of Chemical Exposure Estimates Against Benchmarks

The two risk characterization techniques, the calculation of HQs and the plotting of ∑TUs (as described in Section 3.3.1), were used in the evaluation of surface soils and wildlife. Chemicals of potential concern for each receptor were identified by comparing the total chemical exposure to the NOAEL. Using the generalized wildlife model, the exposure assumptions, and data described above, exposure to chemicals were estimated for the wildlife species (Tables C-4 to C-13). HQs were calculated using the following formula:

$$HQ = \frac{\text{Estimated Exposure (mg/kg/d)}}{\text{NOAEL}}$$

HQs greater than one indicate that individuals may experience adverse effects from the consumption of diet (e.g., vegetation, invertebrates, fish) and surface soil/sediment in each drainage channel. If HQs are less than one, the constituent would unlikely impact the receptor and need not be evaluated further. The COPECs identified for each receptor are presented in the sections below.

4.3.1.1 Herbivorous Wildlife

Chemical concentrations measured in soil, and predicted in vegetation, ecotoxicological benchmarks, and associated HQs for goats and bats are presented in Tables C-4 to C-9. As stated in Section 3.3.1, the COPECs identified in the River Gut were found throughout the gut and were likely transported from upstream sources. The same COPECs were also identified in high concentrations in the Bethlehem Gut and Fair Plain Gut. This suggests that the COPECs measured in surface soils which may potentially impact goats and bats are from multiple sources. The screening process identified the following chemicals as COPECs for goats (italics represents COPECs identified at background locations and constituents underlined represent COPECs identified throughout the gut [i.e., exposure from 95% UCL or average soil concentration exceeded NOAELs]):

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- **River Gut**: *aluminum* and *vanadium*;
- **Bethlehem Gut:** *aluminum* and *vanadium*; and
- **Fair Plain Gut**: *aluminum* and *vanadium*.

The screening process identified the following chemicals as COPECs for fruit bats (italics represents COPECs identified at background locations and constituents underlined represent COPECs identified throughout the gut [i.e., exposure from 95% UCL or average soil concentration exceeded NOAELs]):

- **River Gut**: *aluminum* and selenium (RG-10 and RG-13 only)
- **Bethlehem Gut:** *aluminum*; and
- **Fair Plain Gut**: *aluminum* and selenium (FPG-1 only).

After screening against NOAEL benchmarks, total toxicity at each location was evaluated using the sum of toxic units technique. TUs calculated for herbivorous wildlife are quotients of the exposure of the chemical in the soil divided by the NOAEL. The height of the plot represents the sum of all the toxicity normalized concentrations contributing to more than 5 % of the total toxicity (i.e. $\sum$TU) at each location. Even if the HQ < 1 for a chemical, the chemical was included if it contributed greater than or equal to 5 % of the total $\sum$TUs. The sum of the toxicity normalized concentrations is assumed to estimate the absolute toxicity of soils at the location. Assuming 100% bioavailability, if the $\sum$TU equals or exceeds 1, and all chemicals have the same mode of action, the endpoint effect is likely (i.e., potential reproductive effects on herbivores). This is a conservative assumption for heterogenous chemical mixtures since combined toxic effects of chemicals in environmental samples have been found to be additive or less than additive (Alabaster and Lloyd, 1982).

For illustration, $\sum$TUs for metals identified in soils at each sampling location were calculated and plotted for goats (Figure 7). $\sum$TUs ranged from 42 at location RG-15 to 213 at the reference location RG-2. Aluminum contributed to most of the toxicity at all the locations within the River Gut. In addition, vanadium contributed slightly to the overall potential toxicity to goats foraging

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within the River Gut. Consequently, according to NOAEL ∑TU values, upgradient sources and Bethlehem Gut sources of aluminum pose the greatest potential risk of adverse effects within the gut system.

A ∑TU figure was not presented for fruit bats since aluminum was the only COPEC within the gut system . The patterns of the TU peaks would be similar to that observed for goats, however, the TU heights would be much lower. The maximum NOAEL HQ for aluminum was only 7.7 at the reference location (RG-2). Therefore, the magnitude for a potential impact to bats would be much less than that predicted for goats. Bats experience much less exposure primarily due to their negligible volume of incidental ingestion of soil. For this reason, the potential risks to the fruit bats are greatly minimized. The potential for impacts to goats and bats are discussed further in Section 4.3.2.

4.3.1.2 Insectivorous Wildlife

Chemical concentrations measured in soil, and predicted in soil invertebrates (e.g., earthworms), ecotoxicological benchmarks, and associated HQs for spotted sandpipers are presented in Tables C-10 to C-12. As stated in Section 3.3.1, the COPECs identified in the River Gut were found throughout the gut and likely originated at the upstream reference location. The same COPECs were also identified in the Bethlehem Gut and Fair Plain Gut. This suggests that the COPECs that may potentially impact sandpipers measured in surface soils are from multiple sources.

The screening process identified the following chemicals as COPECs (constituents in italics represent COPECs identified at background locations and constituents underlined represent COPECs identified throughout the gut [i.e., exposure from 95% UCL or average soil concentration exceeded NOAELs]):

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- **River Gut**: *aluminum*, *barium*, cadmium (RG-13 only), *chromium*, *lead*, selenium (RG-13 only), thallium (RG-14 only), *vanadium*, and *zinc*;
- **Bethlehem Gut:** *aluminum*, *barium*, *chromium*, *lead*, *vanadium*, and *zinc;*
- **Fair Plain Gut**: *aluminum*, *chromium*, *lead*, *vanadium*, and *zinc*.

After screening against NOAEL benchmarks, total toxicity at each location was evaluated using the sum of toxic units technique. TUs calculated for insectivorous wildlife are quotients of the exposure of the chemical in the soil and worms divided by the NOAEL as described in Section 4.3.1.1. ∑TUs for metals identified in soils at each sampling location were calculated and plotted (Figure 8). ∑TUs ranged from 13 at location RG-15 to 60 at the reference location (RG-2). Aluminum contributed to most of the toxicity at all the locations within the River Gut. In addition, zinc, lead, chromium, and vanadium (presented in decreasing order) contributed slightly to the overall potential toxicity within the River Gut. Consequently, according to NOAEL ∑TU values, upgradient sources of aluminum and zinc pose the greatest potential risk of adverse effects within the gut. The potential for impacts to spotted sandpipers (and other insectivorous wildlife) are discussed further in Section 4.3.2.

4.3.1.3 Piscivorous Wildlife

Chemical concentrations measured in sediment, and predicted in forage fish, ecotoxicological benchmarks, and associated HQs for great blue herons are presented in Table C-13. The COPECs identified for herons foraging in Fair Plain Gut included aluminum and zinc. Because this evaluation was extremely conservative in nature (i.e., using conservative uptake factors for fish) the potential impact to herons and other piscivorous wildife would likely be much lower than that identified in this assessment. In addition, these constituents were found throughout the gut system and were found at the highest concentration at the upstream reference location in the River Gut (RG-2) and the Bethlehem Gut. The potential for impacts to herons are discussed further in Section 4.3.2.

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4.3.2 Effects Estimation of Retained COPECs for Wildlife Receptors

The laboratory toxicity tests which were used to derive the mammalian and avian ecotoxicological benchmarks are described in the following section. This information was used to determine the potential reproductive effects and the magnitude of the effect which may occur if the NOAEL or LOAEL was exceeded (Table C-14). Each COPEC that was identified for the receptors are discussed below.

4.3.2.1 Aluminum

Aluminum was identified as a COPEC for herbivorous (e.g., goats and fruit bats), insectivorous (e.g., spotted sandpipers), and piscivorous (e.g., great blue herons) wildlife foraging in the River Gut, Bethlehem Gut, and Fair Plain Gut. The potential for adverse impacts from total exposure is discussed below for mammalian and avian receptors.

Mammalian Receptors

The mammalian NOAEL and LOAEL for the goat and bats are based upon a study of the reproductive success of mice for three generations (Ondreicka et al., 1966) (Table 5). The study was considered to represent chronic exposure. A single oral dose level (19.3 mg/kd/d) was administered causing a significant reduction in growth of the second and third generation of mice. This dose did not cause effects on the number of litters or number of offspring per litter. This dose level was selected as the chronic LOAEL. Because an experimental NOAEL was not established, the NOAEL was estimated by multiplying the chronic LOAEL by a LOAEL-NOAEL uncertainty factor of 0.1.

Table C-14 indicates that estimated aluminum exposure to goats was in excess of the LOAEL by 21 times at the reference location (RG-2) to 4 times at the downstream location (RG-15) within the River Gut. The 95% UCL exposure for goats foraging over the entire River Gut was 15 times the LOAEL. Exposure for goats foraging in Bethlehem Gut and Fair Plain Gut also exceeded the LOAEL (HQs ranged from 4.6 to 17.7). Therefore, a reduction in offspring growth for individual

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goats may potentially result from exposure to aluminum in surface soils at all locations within all three drainage channels. In contrast, exposure to Jamaican fruit bats did not exceed the LOAEL in all three drainage channels (LOAEL HQs= 0.15 to 0.98). In addition, the 95% UCL aluminum exposure from foraging within the entire River Gut was only 55% of the LOAEL. Therefore, the bats would unlikely be at risk from foraging on fruit in the riparian habitat of the guts.

Avian Receptors

The avian NOAEL and LOAEL for the spotted sandpiper and great blue heron are based on two separate studies that yield contradictory results (Table 5). The NOAEL is based on a study that exposed ringed doves during a critical life stage to a single dose (1000 ppm Al or 109.7 mg/kg/d). This dose did not result in any significant effects to the doves (Carriere et al., 1986). The LOAEL is based on a study that resulted in adverse effects to day-old white leghorn chicks from an exposure of 44.5 mg/kg/d (Sample et al., 1996). Based on the limited toxicological data available, exposure to insectivorous and piscivorous avian receptors on the site may potentially result in adverse impacts. Similar to the mammalian receptors, the greatest potential risk (maximum LOAEL HQ for sandpipers= 106) would be experienced at the reference location, upstream of the Site.

All Receptors

The occurrence of potential adverse effects to both mammalian and avian receptors are dependent on the bioavailability of aluminum in soil. The studies used to derive the LOAELs are based on administration of aluminum chloride in a water solution. The actual bioavailability of aluminum from soil is much lower than that of the laboratory study. The aluminum concentration in soils within the gut was less than twice the average background concentration of aluminum in surface soils at the site (21,760 mg/kg, See Table 4-1 in Section 4 of the RI Report). Vinogradov (1959) and Jackson (1964) also found the average aluminum concentration in the world to be much higher than that found in the River Gut. Vinogradov (1959) found that an average of 71,300 mg/kg aluminum was found from worldwide sampling, while Jackson (1964) observed a range of 10,000 to 60,000 mg/kg aluminum typical in soils. The NOAA National Status and Trends Program also identified estuarine sediments in the Gulf of Mexico ranging from 1,400 to 113,558 mg/kg aluminum (average= 47,220

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mg/kg; N=351 samples) (NOAA, 1988). Overall, risks to offspring growth are likely minimal due to low bioavailability within soils and concentrations which are within acceptable background ranges for aluminum for the area.

4.3.2.2 Barium

Barium was identified as a COPEC for insectivorous (e.g., spotted sandpipers) wildlife foraging in the River Gut and Bethlehem Gut. The potential for adverse impacts from total exposure is discussed below for avian receptors.

Avian Receptors

The avian NOAEL and LOAEL were based on a study where 1-day old chicks were exposed for four weeks to eight doses (250 ppm to 32,000 ppm) of barium hydroxide (Johnson et al., 1960). A dose of 2,000 ppm (208.23 mg/kg/d) produced no mortality, while chicks exposed to doses between 4,000 ppm (416.53 mg/kg/d) and 32,000 ppm experienced 5% to 100% mortality. The 208 and 416 mg/kg/d doses were considered the subchronic NOAEL and LOAEL. Chronic NOAELs and LOAELs were estimated by multiplying the subchronic NOAELs and LOAELs by a subchronic to chronic uncertainty factor of 0.1 (Table 5).

Exposure to spotted sandpipers was predicted to slightly exceed the chronic NOAEL at the reference location (NOAEL HQ= 1.14) and at three locations within the guts (RG-9, RG-13, BG-1: HQs = 1.26 to 1.44). These exposures did not exceed the LOAEL (HQs= 0.63 to 0.72). Therefore, sandpipers foraging exclusively at these locations would unlikely be at risk from barium exposure. Furthermore, sandpipers would not experience adverse impacts from barium because they forage over a large territory and the 95% UCL exposure in the entire River Gut did not exceed the NOAEL.

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4.3.2.3 Chromium

Chromium was identified as a COPEC for insectivorous (e.g., spotted sandpipers) wildlife foraging in the River Gut, Bethlehem Gut, and Fair Plain Gut. The potential for adverse impacts from total exposure is discussed below for avian receptors.

Avian Receptors

The avian NOAEL and LOAEL are based on a study where black ducks were exposed to two dose levels of Cr^{+3} in the diet (Sample et al., 1996). Survival was reduced at the 50 ppm (1 mg/kg/d) dose level, while no significant differences were observed at the 10 ppm (5 mg/kg/d) dose level. Because these exposures took place throughout a critical lifestage, the doses were considered to be the chronic LOAEL and NOAEL, respectively (Table 5).

The total chromium exposure to spotted sandpipers did slightly exceed the NOAEL at most locations within the River Gut, Bethlehem Gut, and Fair Plain Gut (HQs= 1.8 to 5.7). Exposure did not exceed the LOAEL benchmark at locations within the drainage channels (HQs= 0.37 to 0.73). However, chromium exposure slightly exceeded the LOAEL (HQ=1.14) at a single location (RG-14) within the River Gut (Table C-14). Because the sandpipers forage over a larger territory and would not feed exclusively at location RG-14, sandpipers would unlikely experience a reduction in survivorship. Furthermore, the 95% UCL chromium exposure for sandpipers foraging within the entire River Gut was only 66% of the LOAEL. Therefore, population impacts to sandpipers would unlikely occur from foraging in any of the drainage channels from chromium exposure.

4.3.2.4 Lead

Lead was identified as a COPEC for insectivorous (e.g., spotted sandpipers) wildlife foraging in the River Gut, Bethlehem Gut, and Fair Plain Gut. The potential for adverse impacts from total exposure is discussed below for avian receptors.

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Avian Receptors

The NOAEL and LOAEL were derived using two studies conducted on American Kestrels (Pattee, 1984) and Japanese Quail (Edens et al., 1976), respectively (Table 5). The NOAEL is based on the highest dose (3.85 mg/kg/d) administered to kesterels which resulted in no adverse effects. The LOAELwas based on a study that kestrels were exposed to monitored for reproductive exposed to four dose levels. A dose of 11.3 mg/kg/d caused a reduction in egg hatching success.

Spotted sandpipers would be exposed to levels of lead in excess of the NOAEL (HQs= 1.1 to 7) at most of the locations in the drainage channels. Total lead exposure only slightly exceeded the LOAEL at a several locations (RG-4, RG-5, RG-6, RG-13, and BG-1) in the drainage channels (HQ= 1.04 to 2.4). In addition, the 95% UCL exposure for the entire River Gut barely exceeded the LOAEL (HQ=1.03). Therefore, based on these predicted lead exposures and the results of the toxicological studies, there is a possibility that spotted sandpipers may experience a reduction in egg hatiching success from the consumption of lead in surface soil. However, it must be noted that these expososure calculations are conservative in nature and do not take the low bioavailability of lead into consideration. The minimal bioavailability of lead in soil will likely reduce the potential exposure and thus potential for impacts to the sandpipers foraging in the drainage channels.

4.3.2.5 Vanadium

Vanadium was identified as a COPEC for herbivorous (e.g., goats) and insectivorous (e.g., spotted sandpipers) wildlife foraging in the River Gut, Bethlehem Gut and Fair Plain Gut. The potential for adverse impacts from total exposure is discussed below for mammalian and avian receptors.

Mammalian Receptors

The mammalian NOAEL and LOAEL for the goat and fruit bat are based upon a study on the reproductive success of rats (Domingo et al., 1986). The study was conducted 60 days prior to gestation, through gestation, delivery, and lactation (during a critical life stage); therefore, this study was considered representative of chronic exposure. Three dose levels (5, 10, and 20 mg/kg/d) were

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administered by oral intubation. All three doses caused significant differences in reproductive parameters (i.e., number of dead young/litter, and size and weight of offspring, etc.). Therefore, the lowest dose was considered to be the chronic LOAEL. Because an experimental NOAEL was not established, the NOAEL was estimated by multiplying the chronic LOAEL by a LOAEL-NOAEL uncertainty factor of 0.1 (Table 5).

The total vanadium exposure to goats did exceed the NOAEL at all locations in the drainage channels (HQs= 1.0 to 5.04). However, estimated exposure to vanadium was only 10 to 50% of the LOAEL. Therefore, impacts on reproductive success of individuals foraging within these areas are highly unlikely.

4.3.2.6 Selenium

Selenium was identified as a COPEC for herbivorous (e.g., fruit bats) wildlife foraging in the River Gut and Fair Plain Gut. The potential for adverse impacts from total exposure is discussed below for mammalian receptors.

Mammalian Receptors

The mammalian NOAELs and LOAELs for the goat and bats are based on a study in which selenate was fed to mice for 3 generations (Schroeder and Mitchner, 1971). An administered dose level of 0.76 mg/kg/d, designated as the chronic LOAEL, caused reduced reproductive success with a high incidence of runts and failure to breed. Because an experimental NOAEL was not established, the chronic NOAEL was estimated by multiplying the chronic LOAEL by a LOAEL-NOAEL uncertainty factor of 0.1.

The total selenium exposure to Jamaican fruit bats only slightly exceeded the NOAEL (HQs= 1.06 to 1.62) at three locations in the River Gut and Fair Plain Gut (RG-10, RG-13, and FPG-1). These exposures were all below the LOAEL benchmark. Therefore, impacts on reproductive success of individual bats foraging within the River Gut or other drainage channels are highly unlikely.

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Additionally, since the bats forage over a large territory and overall exposure (95% UCL exposure) did not exceed the NOAEL, bats would not be at risk from selenium in the drainage channels.

4.3.2.7 Zinc

Zinc was identified as a COPEC for insectivorous (e.g., spotted sandpiper) wildlife foraging in the River Gut, Bethlehem Gut, and Fair Plain Gut and piscivorous (e.g., great blue herons) wildlife foraging in Fair Plain Gut. The potential for adverse impacts from total exposure is discussed below for avian receptors.

Avian Receptors

The NOAEL and LOAEL for zinc are derived from a study that exposed White Leghorn Hens to three dose levels for 10 weeks in duration (Stahl et al., 1990). No effects were observed for hens exposed to 228 ppm (14.5 mg/kg/d) zinc, while egg hatchability was < 20% of controls among hens consuming 2028 ppm (131 mg/kg/d) zinc. Therefore, these exposures were identified as chronic NOAEL and LOAEL benchmarks, respectively (Table 5).

Zinc exposure predicted for the spotted sandpiper exceeeded the NOAEL at most locations in the River Gut, Bethlehem Gut, and Fair Plain Gut (HQs = 3.1 to 8.3). The total exposure did not exceed the LOAEL at any location (HQs= 0.34 to 0.92). Therefore, reproductive effects (e.g., reducction in egg hatchability) on sandpipers would be highly unlikely from foraging in the drainage channels. Furthermore, it must be noted that the greatest potential for zinc exposure within the drainage channels may occur at the reference location (RG-2).

Zinc exposure predicted for the great blue heron only slightly exceeded the NOAEL (HQs= 1.01) and was only 12% of the LOAEL. Therefore, it is highly unlikely that herons would experience adverse impacts from exposure to zinc from the consumption of fish in Fair Plain Gut.

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4.3.3 Weight of Evidence Summary

There was only one line of evidence, chemical toxicity data, for the assessment of potential impacts to herbivorous, insectivorous, and piscivorous wildlife foraging on or near the Site. Based on the screening process, six COPECs (aluminum, barium, chromium, lead, vanadium or zinc) were identified in excess of the NOAEL. These COPECs were found throughout the drainage channels and were usually measured at the highest concentration at the reference location (RG-2).

Aluminum is the primary COPEC which exceeded the LOAEL and may potentially pose a risk to individual herbivores, insectivores, and piscivores foraging in the area. However, the likely decrease in the bioavailability of aluminum would reduce the potential for impacts to wildlife foraging in the guts. In addition, the aluminum concentrations are similar to that observed in other areas in the United States and world. Since the highest concentrations of aluminum were observed at the upstream reference location and the Bethlehem Gut, this constituent was likely transported from upgradient and surrounding sources.

Lead exposure in the River Gut (specifically at locations RG-4, RG-5, RG-6 and RG-13) and the Bethlehem Gut (BG-1) may result in adverse reproductive impacts (e.g., reduction in egg hatchibility) to individual spotted sandpipers foraging exclusively at these locations. In addition, the overall 95% UCL exposure did slightly exceed the LOAEL (HQ=1.03). However, because the exposure estimates only slightly exceeded the LOAEL (1.03 to 2.03), potential impacts are likely minimal. Lead is also considered to very unvailable in the soil matrix and would likely further reduce the potential exposure and impacts to insectivorous receptors foraging in the area.

In addition, chromium exposure to sandpipers exceeded the LOAEL at a single location (RG-14) in the drainage channels (HQ=1.14). Since sandpipers forage over a large territory and the 95% UCL exposure was only 66% of the LOAEL, potential impacts to sandpipers from chromium exposure is considered minimal.

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4.3.4 Uncertainties Associated with Risks To Wildlife

- **Soil to Vegetation Uptake Factors.** There is a large degree of uncertainty when using soil to vegetation uptake factors to model chemicals found in vegetation. Uptake factors of inorganics and organics will vary by soil condition (i.e., pH, water availability, organic matter content, texture, aeration, elemental concentrations, etc.) (Sommers et al., 1987; Channey et al., 1984). Using uptake factors assumes that all species and all soil conditions will result in the same uptake rate. Also, using uptake factors assumes that the uptake rate is best estimated by taking the average of all observed values. The Site specific factors at each location were not taken into consideration for the uptake factors which were used. Therefore, the predicted contaminant concentrations in vegetation may be overestimated or underestimated; thus overestimating or underestimating contaminant exposure for wildlife.

- **Soil to Earthworm Uptake Factors or Regression Models.** There is a high degree of uncertainty when predicting chemical concentrations in earthworms. The regression models and uptake factors are very generalized, representing multiple earthworm species, seasons, and soil types and characteristics. Contaminant uptake has been shown to differ by earthworm species (Spurgeon and Hopkin, 1996; Morgan and Morgan, 1991). Contaminant uptake may also differ seasonally (Braunschweiler, 1996) or with life cycle stage (i.e., active vs. diapause) (Morgan and Morgan, 1991). As a consequence of the generalized nature of the uptake factors and models, uncertainty associated with estimates generated for a give location may be high.

- **Chemical Concentrations in Terrestrial and Aquatic Invertebrates.** Concentrations in all invertebrates inhabiting the guts were assumed to be similar to that predicted in earthworms. Because earthworms are highly exposed organisms inhabiting the soil, the use of the soil to worm uptake factor would likely yield a conservative chemical estimate in other invertebrates. The use of these factors will likely overestimate the potential exposure to spotted sandpipers.

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- **Lack of Vegetation/Earthworm Uptake Factors or Regression Models.** If an uptake factor was unavailable for a chemical constituent, the uptake factor was assumed to be 1 (i.e., concentratoin in worm or vegetation is equivalent to the soil). In particular, an uptake factor of 1 was used to predict exposure to receptors from aluminum. Due to the low bioavailability of aluminum in the soil and sediment matrix, this assumption likely overestimates the concentration predicted in the vegetation and worm. Other constituents which apply an uptake factor of 1 were also likely overestimated.

- **Bioavailability of Chemicals**. It was assumed that 100% of the chemical concentrations reported in soil and modeled vegetation were bioavailable. The double acid extraction method used to determine soil concentrations reflects the total potential pool of chemical constituents. The future bioavailability of these chemicals, which is dependent upon the chemical (e.g., pH, organic carbon) and physical (e.g., clay, moisture content) nature of the soil, can not be addressed for this assessment. Therefore, exposure estimates based upon the chemical concentrations in media are highly conservative and are likely to overestimate the actual exposure experienced.

- **Extrapolation from Published Toxicity Data**. To estimate toxicity of chemicals at the Site, it was necessary to extrapolate from NOAELs observed for test species (i.e., rats and mice). While it was assumed that toxicity could be estimated as a function of body size, the accuracy of the estimate is not known. For example, goats or bats may be more or less sensitive than rats or mice to a particular chemical.

  Additional extrapolation uncertainty exists for those chemicals for which data consisted of either LOAELs or was subchronic in duration. For either case, an uncertainty factor of 0.1 was employed to estimate NOAELs or chronic data. The uncertainty factor of 0.1 may either over- or underestimate the actual LOAEL-NOAEL or subchronic-chronic relationship.

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- **Variable Food and Soil Consumption.** While food consumption by wildlife was assumed to be similar to that reported for similar species in other locations, the validity of this assumption cannot be determined. Food consumption in the drainage channels may be greater or less than that reported in the literature, resulting in either an increase or decrease in chemical exposure.

  Incidental ingestion of soil consumption rates were unavailable for goats. Therefore, the ingestion rate derived for cattle and sheep were used for this assessment. To be conservative, exposure was likely overestimated due to the use of the maximum estimate of 18% ingestion of soil when sparse vegetation is present. Vegetation is generally dense at the Site and the soil ingestion rate is likely much less (1 to 2%) (Beyer et al., 1994).

- **Representativeness of Surface Soil Samples**. Exposure to herbivorous and insectivorous wildlife was evaluated based on the concentrations measured in one surface soil sample at each location. Due to the regrading and reshaping maintenance activities which take place in the drainage channels, the soils are transported and may increase or decrease over time.

- **Predicted Concentrations in Fish Tissue.** Concentrations in surface water or fish tissue were unavailable for this assessment. Therefore, the concentrations in fish tissue used to calculate exposure to great blue herons are considered highly uncertain. The use of soil-to-worm uptake factors will likely overestimate the concentrations in forage fish inhabiting Fair Plain Gut. Therefore, the potential exposure and thus potential impacts to herons foraging in the Fair Plain Gut are likely much lower than predicted.

- **Home Range.** To be conservative, the home range of the wildlife receptors was not taken into consideration when calculating exposure to chemicals in the drainage channels. The goats, bats, spotted sandpipers and herons forage over large areas and do not forage exclusively within the study area. Therefore, the estimation of exposure is likely much less than estimated for this SERA.

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5.0 RISKS TO THE BENTHIC MACROINVERTEBRATE COMMUNITY

This section presents the evaluation of the potential for adverse impacts to the benthic macroinvertebrate community from chemicals measured in sediments in Fair Plain Gut.

5.1 EXPOSURE ASSESSMENT FOR BENTHIC MACROINVERTEBRATES

Benthic macroinvertebrates can be exposed to chemicals found adhered or adsorbed to sediment particles or dissolved in pore water between sediment particles. Primary routes of exposure for benthic invertebrates are generally absorption and respiration of sediment pore water and ingestion of sediment and sediment-associated food. Compared to surface water, sediment chemical concentrations have low temporal variability. Benthic invertebrates are also less mobile than water-column species, thereby localizing chemical exposure. Therefore, it was assumed that sediment-associated biota received 100% of their exposure from the sediment at each location. Furthermore, no appropriate quantitative models for exposure through dermal contact, ingestion of sediment, and consumption of food are available. Therefore, the measured concentrations of chemicals in the sediment are considered a conservative estimate of exposure to the benthic macroinvertebrate community.

5.2 EFFECTS ASSESSMENT FOR BENTHIC MACROINVERTEBRATES

This section presents information on the sediment screening benchmarks used for this SERA.

5.2.1 Benchmarks for Sediment Toxicity

Chemical constituents detected in sediments from Fair Plain Gut were screened against ecotoxicological benchmarks to determine if there is or is not a potential for impacts to the benthic macroinvertebrates in the area. Since these areas are estuarine in nature, NOAA Effects Range-Low (ERL) and Effects Range-Median (ERM) (Long et.al., 1995) values were used. If these benchmarks

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were unavailable, Ontario Ministry of the Environment (MOE) Lowest Effects Levels (LELs) and Severe Effects Levels (SELs) (Persaud et al., 1993), Apparent Effects Thresholds (AETs) (Fitchko, 1987), and Wisconsin Department of Natural Resources (WIDNR) Sediment Quality Criteria (SQC) (Geisy and Hoke, 1990) were used to screen chemical concentrations measured in sediment.

NOAA Effects Range-Low/Effects Range-Median (ERL/ERM)

The NOAA ERL and ERM values correspond to the tenth and fiftieth percentile of estuarine sediment concentrations reported to be associated with some level of toxic effects (Long et al., 1995). These sediment quality guidelines (SQGs) were derived using statistical analyses of matching chemistry and biological data compiled from numerous field, laboratory, and modeling studies performed throughout North America. The SQGs were intended as informal (i.e., non-regulatory) benchmarks to aid in the interpretation of chemical data. Low-range values (i.e., ERLs) were intended as concentrations below which adverse effects upon sediment-dwelling fauna would rarely be observed. In contrast, the ERMs represent chemical concentrations above which adverse effects are likely to occur. However, the ERM values are not intended to represent effects thresholds above which adverse effects would always be observed (Long and MacDonald, 1998). The ERL and ERM values represent potential lower and upper benchmarks, respectively.

MOE Lowest Effects Level/Severe Effects Level (LEL/SEL)

The MOE has prepared provincial sediment quality guidelines (SQGs) using the Screening Level Concentration (SLC) Approach. The SLC approach estimates the highest concentration of a particular chemical in sediment that can be tolerated by approximately 95% of benthic infauna (Neff et al., 1988). The SLC is derived from synoptic data on sediment chemical concentrations and benthic invertebrate distributions. These values are based on Ontario sediments and benthic species from a wide range of geographical areas within the province (Persuad et al., 1990). The guidelines define three levels of ecotoxic effects and are based on the chronic, long term effects of constituents on benthic organisms. These levels are a No Effect Level (NEL), an LEL, and an SEL. The LEL is the level at which actual ecotoxic effects may become apparent, although the LEL is a level of chemical measured in sediment that can be tolerated by the majority of benthic organisms. The SEL

indicates the level at which pronounced disturbance of the sediment-dwelling community may be expected. This is the sediment concentration of a compound that may be detrimental to the majority of benthic species (Persaud et al., 1993). The LEL and SEL values represent potential lower and upper benchmarks, respectively.

5.3 RISK CHARACTERIZATION FOR BENTHIC MACROINVERTEBRATES

Risks presented to benthic macroinvertebrate communities inhabiting Fair Plain Gut, as determined by a single line of evidence (sediment analysis and chemical toxicity data), are discussed in the following sections.

5.3.1 Screening of Chemicals in Sediments Against Benchmarks

Chemical concentrations detected in sediments collected in Fair Plain Gut (FPG-3 and FPG-4) sediments were compared to ecotoxicological benchmarks (i.e., ERLs) to evaluate potential impacts to benthic macroinvertebrates. HQs were calculated using the following equation:

$$HQ = \frac{\text{Concentration in Sediment (mg/kg)}}{\text{Ecotoxicological benchmark}}$$

If the HQ is less than or equal to 1, then the probability of adverse ecological impacts to aquatic receptors from the chemical exposure is negligible. Long and MacDonald (1998) have found that for most substances the incidence of effects was less than 15% when concentrations were less than the ERL. HQs greater than one indicate that a chemical is a COPEC for the receptor and may potentially produce adverse ecological impacts. One intent of this SERA is to screen out chemicals that are clearly not of concern. Therefore, conservative estimates of exposure (total bulk dry weight concentrations measured in sediment) and conservative benchmarks (e.g., NOAA ERLs) were used for the screening process. It must be emphasized that these values are highly conservative and are not necessarily indicative of site conditions, but are used for screening purposes.

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The chemical constituents measured in sediment collected from Fair Plain Gut (FPG-3 and FPG-4) did not exceed the low effects screening benchmarks (Table C-15). Therefore, the constituents present in sediment at these locations would unlikely result in adverse impacts to the benthic macroinvertebrate communities inhabiting these locations.

5.4 Weight of Evidence Summary

All chemicals detected in sediments at these locations were below low effects screening benchmarks. Based on this line of evidence, benthic macroinvertebrates inhabiting Fair Plain Gut would not be impacted from chemical constituents detected in sediments.

5.5 Uncertainties Concerning Risks to the Benthic Macroinvertebrate Community

Uncertainties associated with the evaluation of risks to the benthic macroinvertebrate community are presented below.

- **Chemical Concentrations Measured in Sediment Samples.** Risks to the benthic community were evaluated based on the concentrations measured in one sediment sample at each location. Due to the regrading and reshaping maintenance activities which take place in the drainage channels, the sediment are transported and may increase or decrease over time.

- **Chemical Screening**. Sediment benchmarks are derived for typical freshwater or salt/estuarine sediments (depending on the benchmark). Data were derived from analyses of sediments with different physical and geochemical characteristics and from numerous locations throughout North America (Long and MacDonald, 1998). Behavior of the chemicals (and therefore bioavailability) may vary according to the site-specific parameters (pH, TOC, grain size) in sediment and soils. Additionally, since sediments may be heterogeneous over a large

area, exposures of test organisms to the chemicals may be different than the estimated exposure to the fish and invertebrates.

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6.0 SUPPLEMENTAL EVALUATION

A supplemental evaluation of the surface soils collected in the River Gut, Bethlehem Gut, and upstream areas of Fair Plain Gut was conducted as requested by USEPA Region II and NOAA. The surface soils collected at these locations were evaluated for potential impacts to benthic macroinvertebrates (following establishment). Although the probability of this exposure pathway is unlikely, the risk evaluation for these receptors is presented below.

The surface soils at sampling locations in the River Gut, Bethlehem Gut, and upstream areas of Fair Plain Gut were treated as sediment for predicting potential future impacts if these drainage channels were subjected to prolonged inundation with surface water. In this unlikely event, benthic macroinvertebrate communities may establish themselves at these locations and may be exposed to chemical constituents.

To evaluate this potential exposure pathway at these locations, the chemical concentrations detected in surface soil were compared to MOE LELs. These benchmarks were selected for the screening process at these locations since the drainage channels would be inundated with freshwater. If LELs are unavailable, AETs, WIDNR SQCs, and ERLs were used for the screening process. The potential impacts from aluminum exposure could not be evaluated due to the lack of toxicological thresholds for benthic macroinvertebrates. The available benchmarks are discussed in Section 5.2.

It must be noted that these benchmarks were intended to be used for the screening of sediment, not soil. The reliability and predictive ability of the SQGs indicate they can be used effectively to assess the quality of *soft, aqueous, sedimentary deposits* (Long and MacDonald, 1998). Therefore, this screening evaluation only applies to future scenarios following a prolonged series of severe rain events or constant discharge of water from other industrial facilities.

The screening evaluation to determine potential impacts to future benthic macroinvertebrate communities inhabiting these drainage channels are presented in Tables C-16 to C-18. The following

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COPECs within each drainage channel were identified (italics represents COPECs identified at background locations):

- **River Gut:** Cadmium (RG-13 only), chromium (RG-14 only), *copper, iron, manganese,* mercury (RG-9, RG-10, RG-11, RG-14), and *zinc*
- **Bethlehem Gut:** *Copper, iron,* and *manganese*
- **Fair Plain Gut:** *Copper*

Copper, iron, manganese, and zinc were observed at their highest concentration at the upstream reference location (RG-2). This suggests that these COPECs are likely transported from upgradient sources. However, elevated concentrations of cadmium, manganese, and zinc were identified in soils collected from the central storm drain (Table 3). Although this drain may have been a potential source of these constituents to the downstream portions of the River Gut, risks associated with these COPECs are minimal. The concentrations of these COPECs only slightly exceeded the LEL benchmark (HQs < 3.4). Most hazard quotients, with the exception of copper, ranged from 1.06 to 1.95. Furthermore, the concentrations of these chemicals were only a small fraction of the SEL. Therefore, the COPECs identified in the drainage channels would not likely impact benthic macroinvertebrate communities in the future.

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7.0 CONCLUSIONS

The following conclusions can be made concerning the potential for impacts to ecological receptors from exposure to chemical constituents in the River Gut, Bethlehem Gut, and Fair Plain Gut.

- In general, the chemical constituents that were identified as COPECs (particularly aluminum) for each receptor adjacent to or downstream of the Site were found at similar or lower concentrations to that measured at the upstream reference location (RG-2). This suggests that the COPECs have been transported from upgradient sources. Historical (1986) and current (1997) data for soil collected from the central and southern storm drains suggest that several metals (e.g., aluminum, manganese and zinc) may have been historically discharged to downstream areas of the River Gut (near RG-12 and RG-13). This potential contribution of aluminum has decreased over the years, as evidenced by the substantial reduction in concentrations measured in the storm drains in 1997 compared to 1986. In addition, 1997 aluminum concentrations measured in soil from the storm drains were similar to that measured in soil collected from the River Gut upstream of the drain discharge points. Therefore, there is unlikely a current on-site source of aluminum to the River Gut. The Bethlehem Gut, which contained the second highest concentration of aluminum, is also a potential source of exposure in Fair Plain Gut.

- The aluminum concentrations in soils within the guts were within the range of concentrations found worldwide (10,000 to 60,000 mg/kg [Jackson, 1964]; average= 71,300 mg/kg [Vinogradov, 1959]). The aluminum concentration in soils within the gut was less than twice the average background concentration of aluminum in surface soils at the site (21,760 mg/kg, See Table 4-1 in Section 4 of the RI Report). The NOAA National Status and Trends Program also identified estuarine sediments in the Gulf of Mexico ranging from 1,400 to 113,558 mg/kg aluminum (average= 47,220 mg/kg; N=351 samples) (NOAA, 1988).

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- The plant community may be adversely impacted by aluminum, chromium, manganese, mercury, selenium, vanadium, or zinc found in surface soil in the drainage channels. These constituents, as identified in laboratory toxicity tests, have the potential to cause adverse impacts including reduction in seedling establishment, shoot growth, and overall plant growth. However, the soil physicochemical properties (e.g., high pH, elevated TOC, high CEC and oxidation potential) would likely reduce the bioavailability of these metals and thus reduce the potential for impacts.

- Herbivorous wildlife, specifically goats, may be at risk from exposure to aluminum at all locations in all three drainage channels. Total aluminum exposure to goats exceeded LOAEL benchmarks and suggests that individual goats may experience adverse impacts from consumption of vegetation and soil in the area. However, this evaluation is based on the use of a soil-plant uptake factor of 1. Because this uptake factor likely overestimates the predicted concentration in vegetation and bioavailibility of aluminum is likely reduced in the soil matrix, impacts are likely much less than predicted.

- Herbivorous wildlife, specifically Jamaican fruit bats, would not be at risk from exposure to chemical constituents in the drainage channels. Aluminum and selenium exposure only slightly exceeded the NOAEL at a few locations and did not exceed LOAEL benchmarks. Therefore, impacts on the reproductive success of fruit bats are unlikely.

- Insectivorous wildlife (e.g., spotted sandpipers) foraging within all the drainage channels may potentially experience adverse impacts from aluminum exposure. As discussed above, the low biovailability of aluminum in the soil matrix will likely reduce the potential exposure and subsequent impacts to sandpipers. The predicted exposure was also likely overestimated by using a soil to worm uptake factor of 1. Therefore, potential for impacts described in this assessment are likely much less than predicted.

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There is also a potential for reproductive impacts on sandpipers from lead exposure. Three locations within the River Gut, the 95% UCL exposure for the entire River Gut, and a location in Bethlehem Gut slightly exceeded the LOAEL. Since lead is highly unavailable in the soil and sediment matrix, exposure and impacts to sandpipers are likely minimal.

- Piscivorous wildlife (e.g., great blue herons) foraging in the Fair Plain Gut may potentially be impacted from exposure to aluminum in sediments and forage fish. As discussed above, the aluminum found in the Fair Plain Gut is a a result of watershed-wide contamination and was measured at the highest concentrations at the reference location in the River Gut (RG-2) and Bethlehem Gut (directly upstream of Fair Plain Gut). Exposure in this assessment was also likely overestimated due to the conservative predicted concentration in fish (i.e., uptake factor of 1 was used). Additionally, reduced bioavailability of aluminum in sediments will also result in a decrease in potential impacts to herons.

- Benthic macroinvertebrates inhabiting the aquatic environment of Fair Plain Gut (FPG-3 and FPG-4) would not be impacted from chemical constituents found in the sediment. The screening evaluation revealed that chemical constituents measured in sediment were below sediment screening benchmarks (e.g., lowest effects levels).

- Hypothetical future benthic macroinvertebrate populations that may be established in the River Gut, Bethlehem Gut and upstream areas of Fair Plain Gut have the potential to be impacted from chemical constituents (copper, iron, manganese, zinc) measured in the soils. However, the soil concentrations were only a fraction of the SELs. Therefore, the COPECs identified in the drainage channels would not likely impact benthic macroinvertebrate communities in the future.

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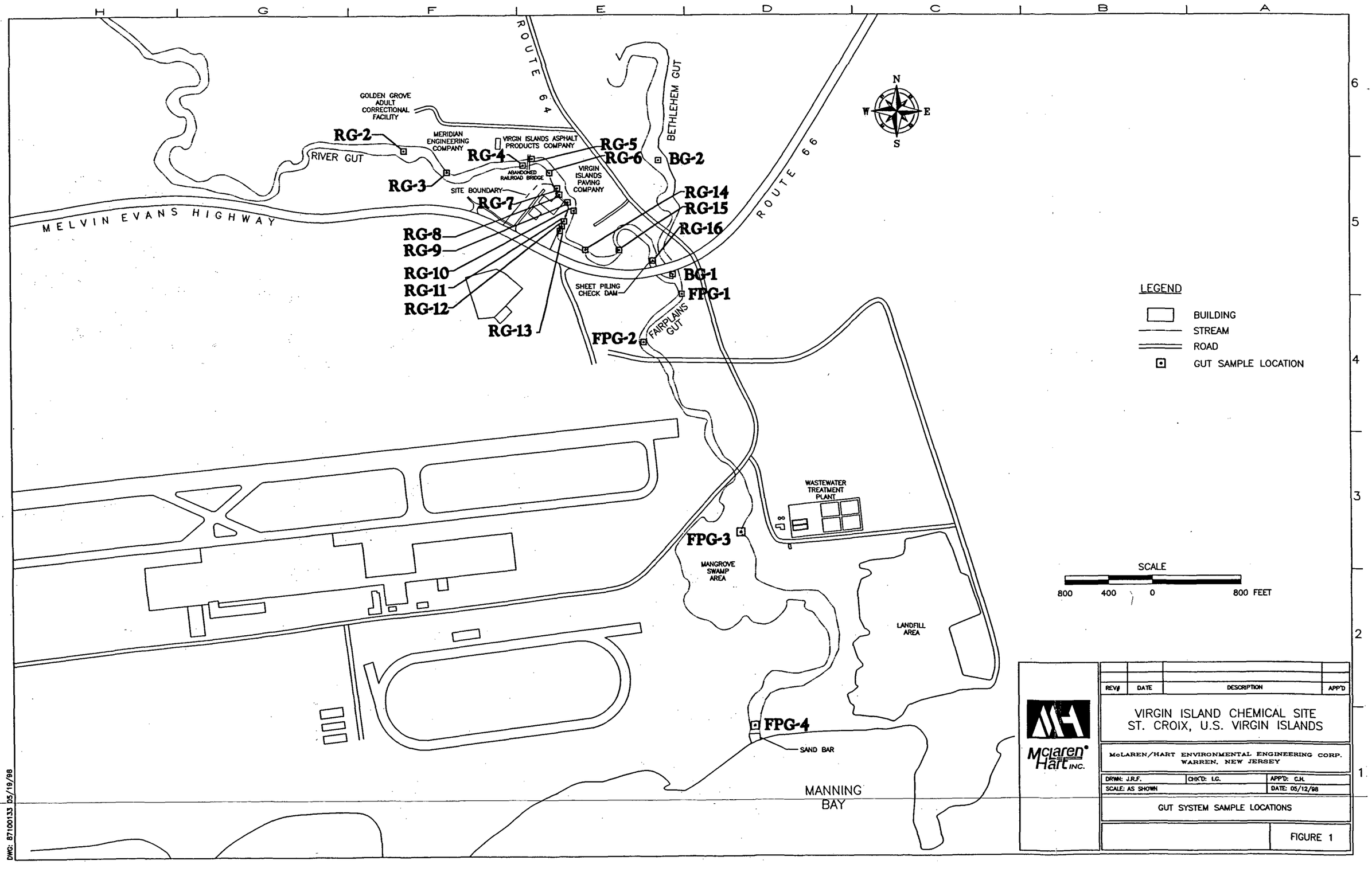
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FIGURES



REV#	DATE	DESCRIPTION	APP'D

VIRGIN ISLAND CHEMICAL SITE
ST. CROIX, U.S. VIRGIN ISLANDS

McLAREN/HART ENVIRONMENTAL ENGINEERING CORP.
WARREN, NEW JERSEY

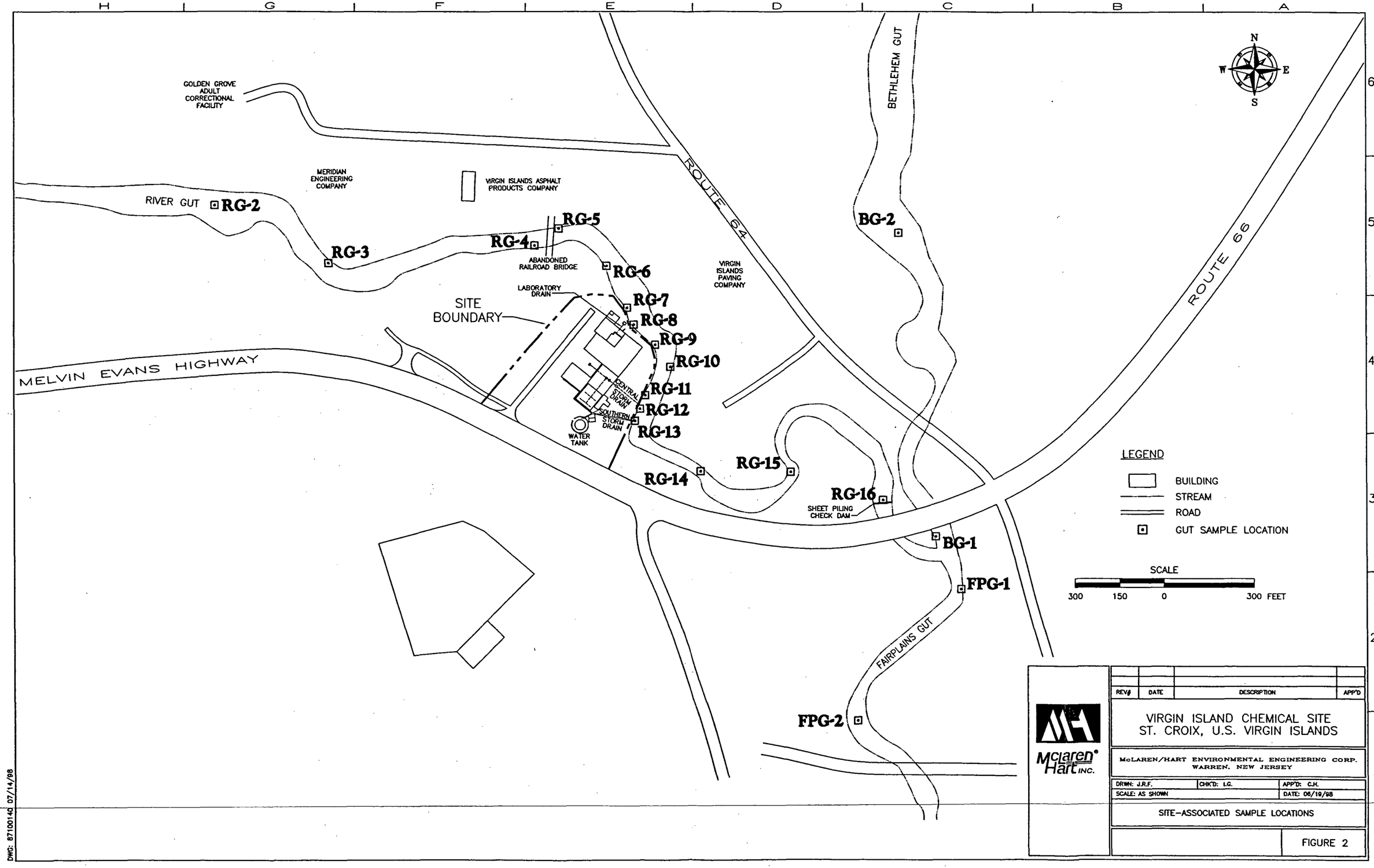
DRWN: J.R.F.	CHK'D: I.G.	APP'D: C.H.
SCALE: AS SHOWN		DATE: 05/12/98

GUT SYSTEM SAMPLE LOCATIONS

FIGURE 1

DWG: B7100133 05/19/98

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REV#	DATE	DESCRIPTION	APP'D

VIRGIN ISLAND CHEMICAL SITE
ST. CROIX, U.S. VIRGIN ISLANDS

McLAREN/HART ENVIRONMENTAL ENGINEERING CORP.
WARREN, NEW JERSEY

DRWN: J.R.F.	CHK'D: L.G.	APP'D: C.H.
SCALE: AS SHOWN		DATE: 06/19/98

SITE-ASSOCIATED SAMPLE LOCATIONS

FIGURE 2

DWG: 8710014D 07/14/98

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TABLES

Table 1: Soil and Sediment Sampling Locations

Location	Description
River Gut	
RG-2	Upstream Reference Location- 200 feet upstream of the Meridan Engineering Company (Soil).
RG-3	Background sample was collected 100 feet downstream of Meridan Engineering Company (Soil).
RG-4	Background sample was collected downstream of the Asphalt Products Company and 25 feet upstream of the abandoned railroad bridge. This sample indicates the contribution of chemicals to the River Gut from the asphalt facility (Soil).
RG-5	Sample was collected on the southwestern stream bank, 100 feet upstream of the site boundary in a depositional area of the stream bed, just downstream of the abandoned railroad bridge (Soil).
RG-6	Sample was collected on the northeastern stream bank in an area of petroleum-like waste material in the fill observed during 1995 investigations. RG-6 is located adjacent RG-5, just downstream of the railroad bridge (Soil).
RG-7	Sample was collected from the depositional areas of the stream bed upstream of the former lab drain discharge (Soil).
RG-8	Sample was collected from the depositional areas of the stream bed below the former lab drain (Soil).
RG-9	Sample was collected from the depositional areas of the stream bed approximately 100 feet downstream of RG-8 (Soil).
RG-10	Sample was collected in an area of waste material observed in the fill on the northeastern side of the stream bank (Soil).
RG-11	Sample was collected from the depositional areas of the stream bed at a point approximately 50 feet upstream of the discharge of the central storm drain system (Soil).
RG-12	Sample was collected from the depositional areas of the stream bed at a point where the central storm drain system from the site discharges to the River Gut (Soil).
RG-13	Sample was collected from the depositional areas of the stream bed at the point where the southern storm drain system from the site discharges to the River Gut (Soil).
RG-14	Sample was collected from the depositional areas of the stream bed at approximately 200 feet downstream of sample RG-13. This location is also adjacent Charlies Concrete Company (Soil).

Table 1: Soil and Sediment Sampling Locations

Location	Description
RG-15	Sample was collected from deposits approximately 300 feet downstream of RG-14 (Soil).
RG-16	Sample was collected from deposits on the upstream side of the sheet piling installed in the River Gut stream channel, downstream of the site. This location is approximately 300 feet downstream of RG-15 and 400 feet upstream of the confluence with the Bethlehem Gut (Soil).
Bethlehem Gut	
BG-1	Sample was collected directly (within 50 feet) upstream from the confluence of the River and Bethlehem Guts (Soil).
BG-2	Sample was collected 1,000 feet upstream from the confluence of the River and Bethlehem Guts (Soil).
Fair Plain Gut	
FPG-1	Sample was collected below the confluence of the River and Bethlehem Guts. This sample will be located in the depositional area approximately 25 feet downstream of the confluence (Soil).
FPG-2	Sample was collected 300 feet downstream of FPG-1, and 50 feet upstream of the Sewage Treatment Plant outfall (Soil).
FPG-3	Sample was collected approximately 125 feet downstream of FPG-2, 75 feet downstream of the Sewage Treatment Plant outfall (Sediment).
FPG-4	Sample was collected upstream of the mouth of Manning Bay on the upstream side of the berm (Sediment).

Table 2: Historic Sediment Sampling Results (mg/kg)
Virgin Island Chemical Site

Location:	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11
	ESI/ICMI	ESI/ICMI	ESI/ICMI	ESI/ICMI	ESI/ICMI	ESI/ICMI	ESI/ICMI	ESI/ICMI	ESI/ICMI	ESI/ICMI	ESI/ICMI
Date Sampled:	2/19/86	2/19/86	2/19/86	2/19/86	2/19/86	2/19/86	2/19/86	2/19/86	2/19/86	2/19/86	2/19/86
Aluminum											
Antimony											
Arsenic											
Barium											
Cadmium						1	2.4				
Calcium											
Chromium	14.5	16.4	16.7	12	17.1	46.6	71.1	20.4	19.8	30.6	41.1
Cobalt											
Copper	37.3	38.3	33.8	25.3	36.1	40	51.4	32.8	34.9	62.7	69.7
Iron											
Lead	21	22	14.5	13.2	20.2	32.9	46.4	19.4	21.4	16.5	12.8
Magnesium											
Manganese											
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Vanadium											
Zinc	63.1	57.8	129	37.1	57.2	349	861	76.2	75.7	66.5	871

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Table 2: Historic Sediment Sampling Results (mg/kg)
Virgin Island Chemical Site

Location:	Gut Background	Gut Waste Pit Seep	Gut Drainage Pit	Gut 500' Downstream SED1	Gut Lab Drain SED2	Gut Upstream SED3	Gut Lab Drain Dup. SED4	Gut Central Storm Drain SED5	Gut Southern Storm SED6
	EPA	EPA	EPA	EPA	EPA	EPA	EPA	EPA	EPA
Date Sampled:	3/13/86	3/13/86	3/13/86	2/28/91	2/28/91	2/28/91	1/28/91	2/28/91	2/28/91
Aluminum				15700	32400	30400	33600	9400	10600
Antimony		10						26.6	
Arsenic	2	1	0.8		3.2	4.1	3.8	8	5.5
Barium				90.3	115	111	122	48.8	95.8
Beryllium		7	8						
Cadmium									4.5
Calcium				45600	74900	79900	82100	51200	42100
Chromium	10	22	52	18.7	16.3	17.6	16.8	57.6	110
Cobalt				14.7	23.7	24.8	25.4	13.8	17.3
Copper	40	45	52	46.4	60.5	62	64.8	367	109
Iron				25700	35800	39200	38400	183000	121000
Lead				15.1	7.5	7.5	7.8	466	187
Magnesium				7600	10900	11800	11800	4740	5000
Manganese				954	1320	1400	1430	925	1420
Mercury									
Nickel	19	20	32	10.8	13.8	14.6	15.2	47.8	49.8
Potassium					1490		1600		
Selenium	1		1						
Sodium					1640		1750		
Vanadium				82.4	62.1	63.2	64.8		

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Table 3: Chemical Concentrations Measured from Soil from the Central and Southern Storm Drains Virgin Island Chemical Site

LOCATION	Central Storm Drain	Central Storm Drain	Southern Storm Drain	Southern Storm Drain
SAMPLE ID NO	SDCSD-2	SDCSD-3	SDSSD-1	SDSSD-2
DATE SAMPLED	10/7/97	10/7/97	10/7/97	10/7/97
ANALYTE				
Aluminum	8390	8890	14600	13500
Antimony	0.62 UJ	0.56 UJ	0.45 UJ	0.47 UJ
Arsenic	8.8	3.7	0.81 B	0.87 B
Barium	70.3	44 B	68.9	59.2
Beryllium	0.03 UJ	0.03 UJ	0.02 UJ	0.02 UJ
Cadmium	3.9	3.9	0.52 B	0.72 B
Calcium	76900 J	56300 J	56400 J	53600 J
Chromium	32	22.7	13.9	14.6
Cobalt	9.4 BJ	7.5 BJ	10 BJ	9.4 BJ
Copper	280 J	121 J	30.7 J	35.2 J
Iron	58800	19700	19100	18800
Lead	35.2	25.4	3.9	7.3
Magnesium	4090	4840	5870	6170
Manganese	595 J	311 J	503 J	494 J
Mercury	0.15U	0.14 U	0.11 UJ	0.12 U
Nickel	23.5	14.5	9 B	8.3 B
Potassium	838 B	1060 B	3650	3400
Selenium	0.94 BJ	0.69 UJ	0.57 UJ	0.58 UJ
Silver	1.5 B	1.2 B	0.98 B	0.92 B
Sodium	675 B	659 B	373 B	453 B
Thallium	0.68 U	0.61 U	0.5 U	0.51 U
Vanadium	34.3	39.5	52.1	50.1
Zinc	336	346	40.5 R	74.4
Cyanide	NA	NA	NA	NA

Notes:
Concentrations presented in mg/kg
NA: Not Analyzed
U - Not detected; value is the minimum quantitation limit.
J - Estimated value.
R - Data Rejected.
B - Result is between instrument detection limit (IDL) and Contract Required Detection Limit (CRDL).

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Table 4: Physicochemical Properties of Surface Soil and Sediment Collected in the Drainage Channels Virgin Island Chemical Site

Location	Grain Size %			Alkalinity (mg/kg)	Oxidation/Reduction Potential	pH	Specific Conductance (umhos)	Total Organic Carbon mg/kg	Total Solids mg/kg
	Gravel/Sand	Silt	Clay						
River Gut									
RG-2	12.7	74.7	12.6	427	207	8.66	91	17800	78.3
RG-3	4.0	86.5	9.5	962	203	8.27	123	21300	74
RG-4	18.8	80.3	0.9	425	188	8.32	108	22400	86.6
RG-5	59.4	20.0	20.6	4680	172	8.65	70.1	29600	92.9
RG-6	75.8	3.9	20.3	640	175	8.3	95.9	24300	88.7
RG-7	64.7	18.9	16.4	530	174	8.3	71.5	30500	85.9
RG-8	59.0	16.2	24.8	1180	177	8.22	106	37900	84.4
RG-9	50.9	25.7	23.4	428	181	7.97	139	19600	86.9
RG-10	52.6	31.1	16.3	631	169	8.35	154	30800	87.6
RG-11	54.7	19.1	26.2	1070	174	8.29	104	15000	84.1
RG-12	54.5	19.7	25.8	630	228	8.28	80.7	26800	82.4
RG-13	51.0	18.2	30.9	636	196	7.95	167	28600	85.6
RG-14	39.4	51.1	9.5	4340	26.3	12.1	1920	49500	49.3
RG-15	80.0	12.7	7.3	417	200	8.71	133	22500	86
RG-16	87.2	4.0	8.8	422	156	8.51	124	18300	78.4
Bethlehem Gut									
BG-1	38.3	22.9	38.9	524	197	8.02	147	27800	66
BG-2	94.5	0.0	5.5	319	184	8.7	69.6	12900	94.9
Fair Plain Gut									
FPG-1	66.4	10.9	22.6	530	181	8.12	154	27700	72.9
FPG-2	54.8	20.5	24.6	528	169	8.39	148	19100	79.5
FPG-3	76.0	3.9	20.1	1050	96	8.25	1550	17200	65.7
FPG-4	99.0	0.3	0.6	317	116	8.63	337	9910	80.9

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Table 5: Derivation of Chronic NOAEL and LOAEL Ecotoxicological Benchmarks for Mammalian and Avian Receptors

Chemical	Study Description and Source	Test Species Dose (mg/kg/d)		Receptor NOAEL (mg/kg/d)			
		NOAEL	LOAEL	Goat	Fruit Bat	Spotted Sandpiper	Great Blue Heron
Aluminum	Chronic NOAEL for reduction in growth for mice (Ondreika et al., 1966)	1.93	19.3	0.33	1.69	109.7	109.7
	Chronic NOAEL for reproductive effects in ringed doves (Carriere et al., 1986). Chronic LOAEL for reproductive effects for white leghorn chicks (Sample et al., 1996)	109.7	44.5				
Antimony	Chronic LOAEL which reduced lifespan of mice. A LOAEL – NOAEL uncertainty factor of 0.1 was applied (Schroeder et al., 1968)	.125	1.25	0.02	0.11	NA	NA
Arsenic	Chronic LOAEL which resulted in a decline in litter size of mice. A LOAEL-NOAEL uncertainty factor of 0.1 was applied (Schroeder and Mitchner, 1971).	.126	1.26	0.02	0.11	5.135	5.135
	Chronic NOAEL and LOAEL for mortality in mallard ducks (USFWS, 1964)	5.135	12.84				

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Table 5: Derivation of Chronic NOAEL and LOAEL Ecotoxicological Benchmarks for Mammalian and Avian Receptors

Chemical	Study Description and Source	Test Species Dose (mg/kg/d)		Receptor NOAEL (mg/kg/d)			
		NOAEL	LOAEL	Goat	Fruit Bat	Spotted Sandpiper	Great Blue Heron
Aluminum	Chronic NOAEL for reduction in growth for mice (Ondreika et al., 1966)	1.93	19.3	0.33	1.69	109.7	109.7
	Chronic NOAEL for reproductive effects in ringed doves (Carriere et al., 1986). Chronic LOAEL for reproductive effects for white leghorn chicks (Sample et al., 1996)	109.7	44.5				
Antimony	Chronic LOAEL which reduced lifespan of mice. A LOAEL – NOAEL uncertainty factor of 0.1 was applied (Schroeder et al., 1968)	.125	1.25	0.02	0.11	NA	NA
Arsenic	Chronic LOAEL which resulted in a decline in litter size of mice. A LOAEL-NOAEL uncertainty factor of 0.1 was applied (Schroeder and Mitchner, 1971).	.126	1.26	0.02	0.11	5.135	5.135
	Chronic NOAEL and LOAEL for mortality in mallard ducks (USFWS, 1964)	5.135	12.84				

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Table 5: Derivation of Chronic NOAEL and LOAEL Ecotoxicological Benchmarks for Mammalian and Avian Receptors

Chemical	Study Description and Source	Test Species Dose (mg/kg/d)		Receptor NOAEL (mg/kg/d)			
		NOAEL	LOAEL	Goat	Fruit Bat	Spotted Sandpiper	Great Blue Heron
Barium	Chronic NOAEL for growth and food/water consumption for rats (Perry et al., 1983). Chronic LOAEL for mortality of rats (Borzelleca et al., 1988)	5.1	19.8	1.62	8.29	20.8	20.8
	Subchronic NOAEL and LOAEL for mortality of chicks. A subchronic-chronic uncertainty factor of 0.1 was applied (Johnson et al., 1960)	20.8	41.7				
Beryllium	Chronic NOAEL for rats (Schroeder and Mitchner, 1975)	0.66	NA	0.21	1.07	NA	NA
Cadmium	Chronic NOAEL and LOAEL for reproductive effects (e.g., reduction in fetal survivorship and fetal implantations) for rats (Sutou et al., 1980).	1	10	0.32	1.63	1.45	1.45
	Chronic NOAEL and LOAEL for reproductive effects (e.g., reduction in egg production) for mallard ducks (White and Finley, 1978).	1.45	20				

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Table 5: Derivation of Chronic NOAEL and LOAEL Ecotoxicological Benchmarks for Mammalian and Avian Receptors

Chemical	Study Description and Source	Test Species Dose (mg/kg/d)		Receptor NOAEL (mg/kg/d)			
		NOAEL	LOAEL	Goat	Fruit Bat	Spotted Sandpiper	Great Blue Heron
Chromium	Chronic NOAEL for Cr+6 for rats (MacKenzie et al., 1958). Subchronic LOAEL for Cr+6 for rats. A subchronic-chronic uncertainty factor of 0.01 was applied (Steven et al., 1976 [cited in Eisler, 1986).	3.28	13.14	1.04	5.34	1	1
	Chronic NOAEL and LOAEL for reproductive effects in black ducks (Haseltine et al., unpublished data, reported in Sample et al., 1996).	1	5				
Cobalt	Chronic NOAEL and LOAEL for behaviorial and reproductive effects (e.g., testicular atrophy) on rats (Nation et al., 1983).	5	20	1.57	8.13	NA	NA
Copper	Chronic NOAEL and LOAEL for reproductive effects in mink (Aulerich et al., 1982).	11.7	15.14	4.83	24.74	47	47
	Chronic NOAEL and LOAEL for growth and mortality of chicks (Mehring et al., 1960).	47	61.7				

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Table 5: Derivation of Chronic NOAEL and LOAEL Ecotoxicological Benchmarks for Mammalian and Avian Receptors

Chemical	Study Description and Source	Test Species Dose (mg/kg/d)		Receptor NOAEL (mg/kg/d)			
		NOAEL	LOAEL	Goat	Fruit Bat	Spotted Sandpiper	Great Blue Heron
Cyanide	Chronic NOAEL for reproductive effects for rats (Tewe and Maner, 1981).	68.7	NA	20.49	105.01		
Lead	Chronic NOAEL and LOAEL (resulting in reproductive effects and kidney damage) for rats (Azar et al., 1973)	8	80	0.36	1.84	3.85	3.85
	Chronic NOAEL for American Kestrels (Pattee, 1984). Chronic LOAEL resulting in reduction of egg hatching success for Japanese Quail (Edens et al., 1976).	3.85	11.3				
Manganese	Chronic NOAEL and LOAEL for reproductive effects (e.g., reduction in fertility) of rats (Laskey et al., 1982).	88	284	27.93	143.14	977	977
	Chronic NOAEL for Japanese Quail (Laskey and Edens, 1985).	977	NA				
Mercury	Chronic NOAEL for reproductive effects for mink (Aulerich et al., 1974).	1.01	NA	0.41	2.11	0.45	0.45

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Table 5: Derivation of Chronic NOAEL and LOAEL Ecotoxicological Benchmarks for Mammalian and Avian Receptors

Chemical	Study Description and Source	Test Species Dose (mg/kg/d)		Receptor NOAEL (mg/kg/d)			
		NOAEL	LOAEL	Goat	Fruit Bat	Spotted Sandpiper	Great Blue Heron
	Chronic NOAEL and LOAEL (resulting in decreased fertility and hatchability, increased egg production) for Japanese Quail (Hill and Schaffner, 1976).	0.45	0.9				
Nickel	Chronic NOAEL and LOAEL for reproductive effects in rats (Ambrose et al., 1976).	40	80	12.69	65.06	77.4	77.4
	Chronic NOAEL and LOAEL for mortality effects in mallard ducks (Cain and Pafford, 1981)	77.4	107				
Selenium	Chronic NOAEL and LOAEL (resulting in reduced fertility, growth, and survivorship) for rats (Rosenfeld and Beath, 1954).	0.20	0.33	0.06	0.33	0.4	0.4
	Chronic NOAEL and LOAEL for mortality effects for mallard ducks (Heinz et al., 1987).	0.4	0.8				
Silver	Chronic NOAEL and LOAEL for mortality effects on rats (Walker, 1971).	18.1	36.2	5.74	29.44	NA	NA

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Table 5: Derivation of Chronic NOAEL and LOAEL Ecotoxicological Benchmarks for Mammalian and Avian Receptors

Chemical	Study Description and Source	Test Species Dose (mg/kg/d)		Receptor NOAEL (mg/kg/d)			
		NOAEL	LOAEL	Goat	Fruit Bat	Spotted Sandpiper	Great Blue Heron
Thallium	Subchronic LOAEL resulting in reduced sperm motility in rats. Subchronic-chronic and LOAEL-NOAEL uncertainty factors of 0.1 were applied (Formigli et al., 1986).	0.0074	0.074	0.002	0.012	0.12	0.12
	LD50 for mortality in ring-necked pheasants (Hudson et al., 1984). Uncertainty factors for test duration and endpoints were applied.	0.12	NA				
Vanadium	Chronic LOAEL resulting in reduction of offspring survivorship, size and weight of rats. A LOAEL-NOAEL uncertainty factor of 0.1 was applied (Domingo et al., 1986).	0.21	2.1	0.067	0.34	11.4	11.4
	Chronic NOAEL for mallard ducks (White and Dieter, 1978).	11.4	NA				
Zinc	Chronic NOAEL and LOAEL (resulting in reduction in fetal growth and increase of fetal resorption) for rats (Schlicker and Cox, 1968).	2.1	2.6	50.78	260.25	14.5	14.5

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Table 5: Derivation of Chronic NOAEL and LOAEL Ecotoxicological Benchmarks for Mammalian and Avian Receptors

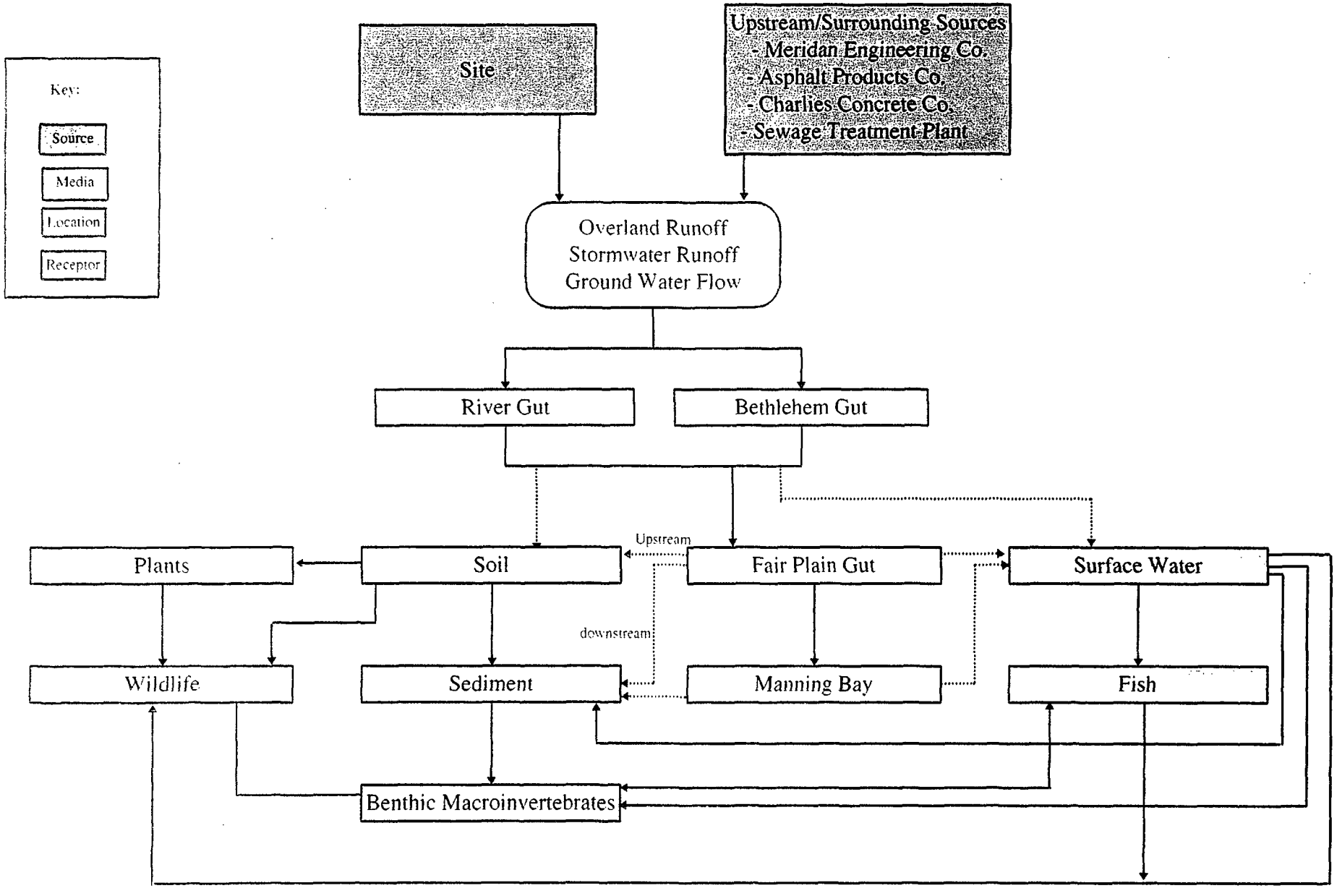
Chemical	Study Description and Source	Test Species Dose (mg/kg/d)		Receptor NOAEL (mg/kg/d)			
		NOAEL	LOAEL	Goat	Fruit Bat	Spotted Sandpiper	Great Blue Heron
	Chronic NOAEL and LOAEL (reduction in egg hatchibility) for white Leghorn Hens (Stahl et al., 1990).	14.5	131				

Notes:
NA: Not Available

* Toxicological studies found in Sample et al., 1996.
* Goat and fruit bat NOAELs derived using the following equation: $NOAEL_{receptor} = NOAEL_{test\ species} (BW_{test\ species}/BW_{receptor})^{1/4}$ (Section 4.2). Where: rat BW= 0.35 kg (USEPA, 1985) with exception of cyanide where rat BW= 0.273 (Tewe and Maner, 1981); mouse BW= 0.03 kg (USEPA, 1985); and mink BW= 1.0 (Aulerich et al., 1982 and 1974).
* Avian NOAELs were not scaled for body weight (Section 4.2).

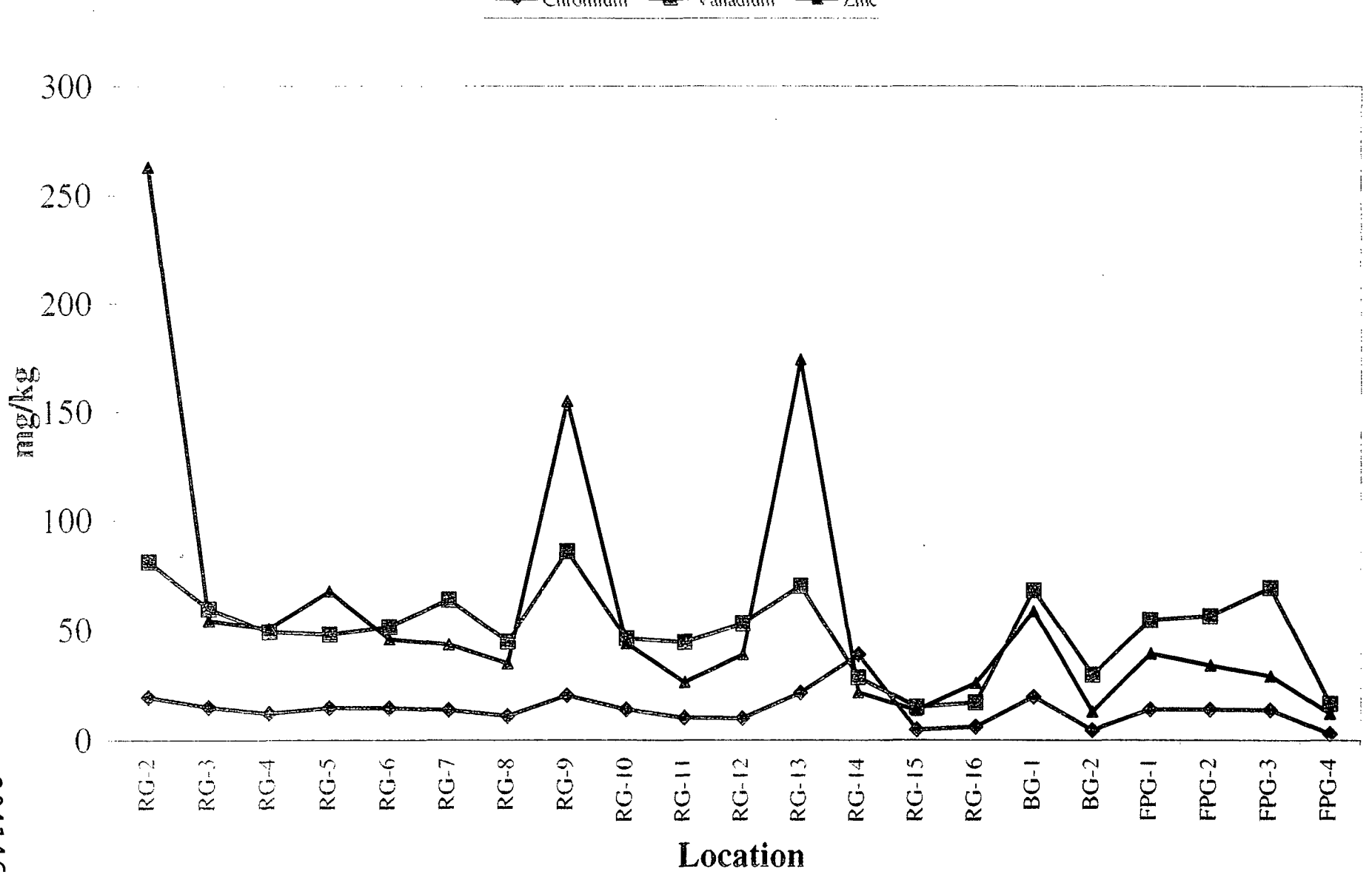
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FIGURE 3: CONCEPTUAL SITE MODEL FOR THE VIRGIN ISLAND CHEMICAL SITE



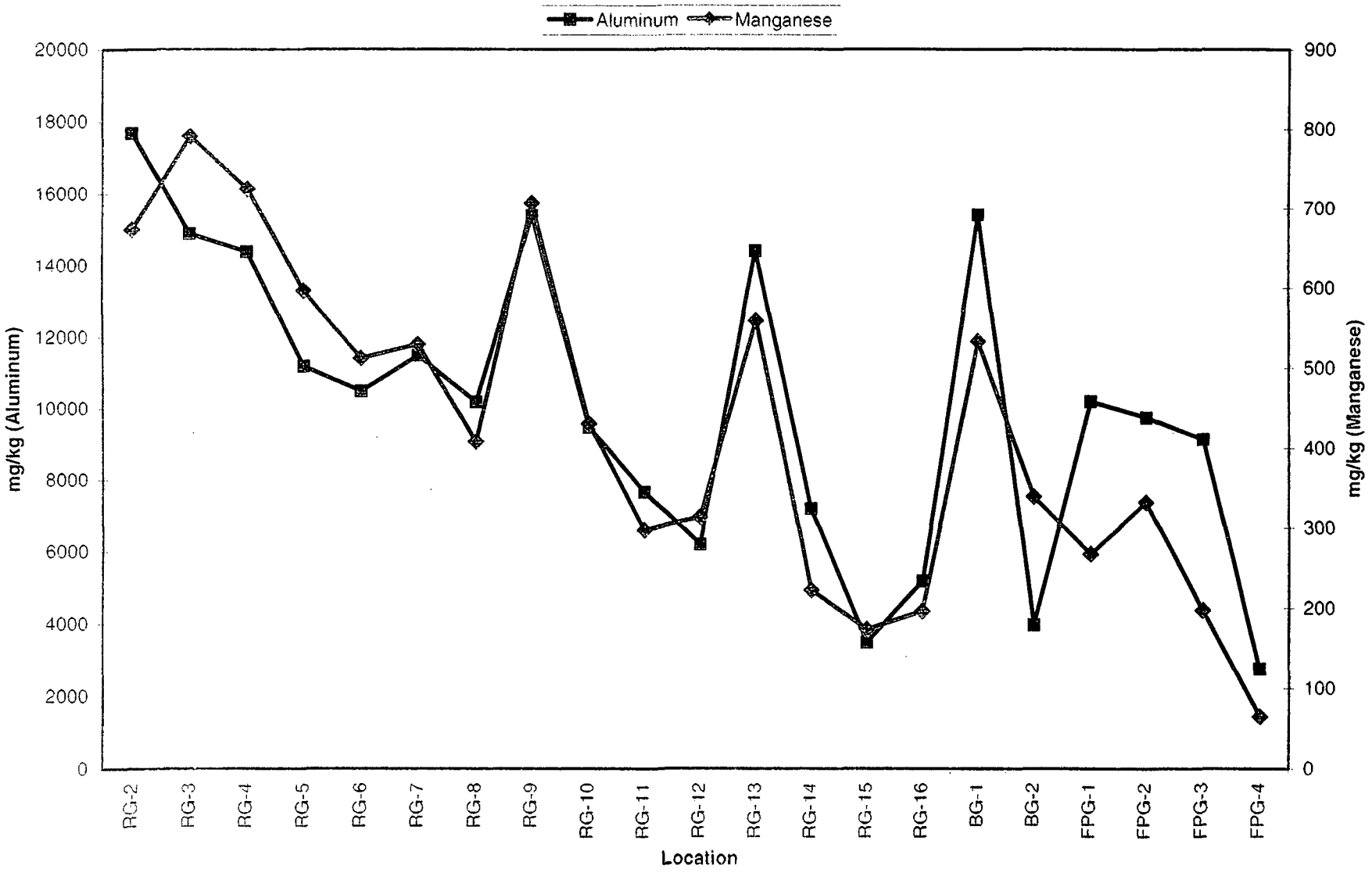
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Figure 4: Distribution of Chromium, Vanadium, and Zinc in the Drainage Channels



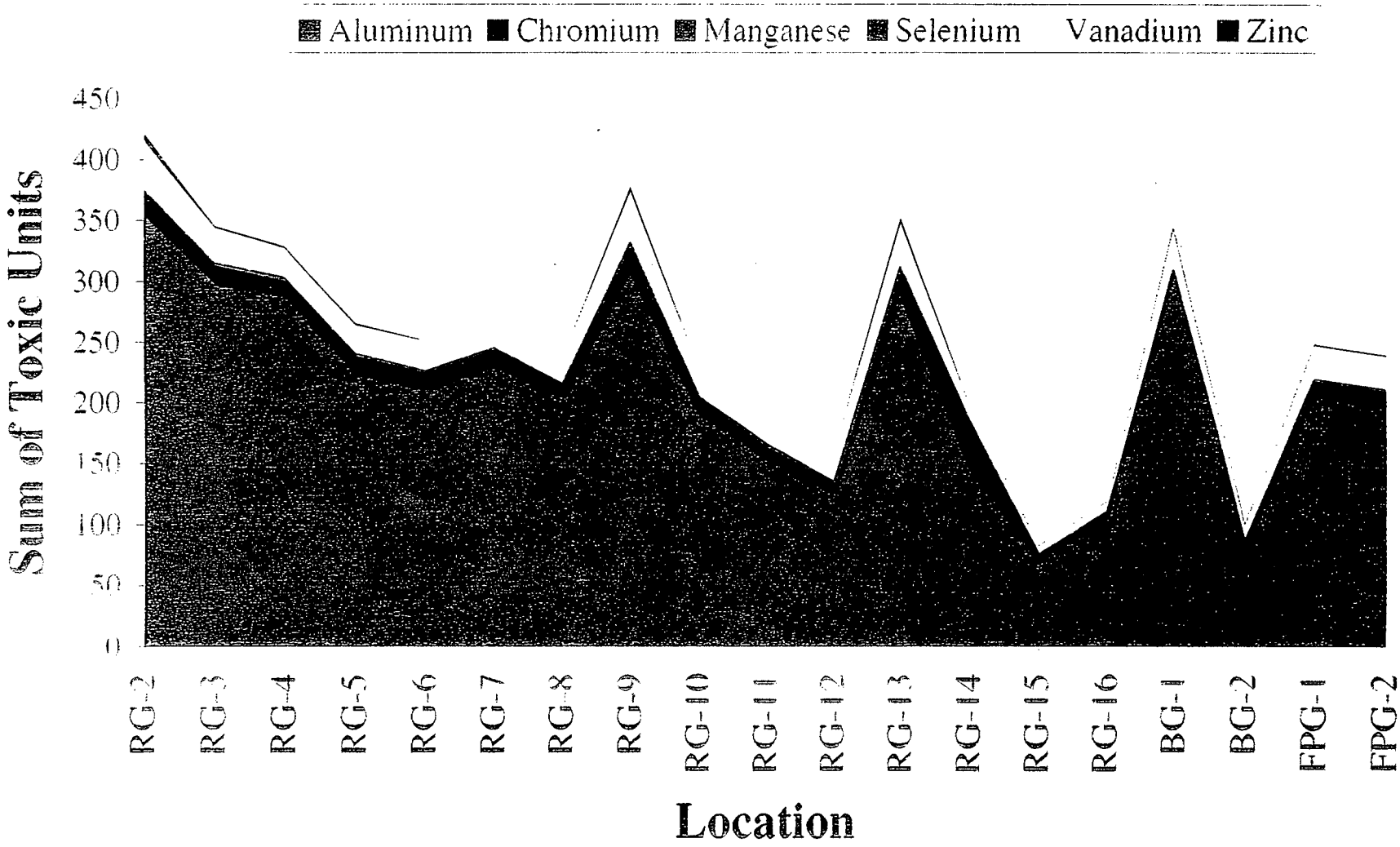
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Figure 5: Distribution of Aluminum and Manganese in the Drainage Channels



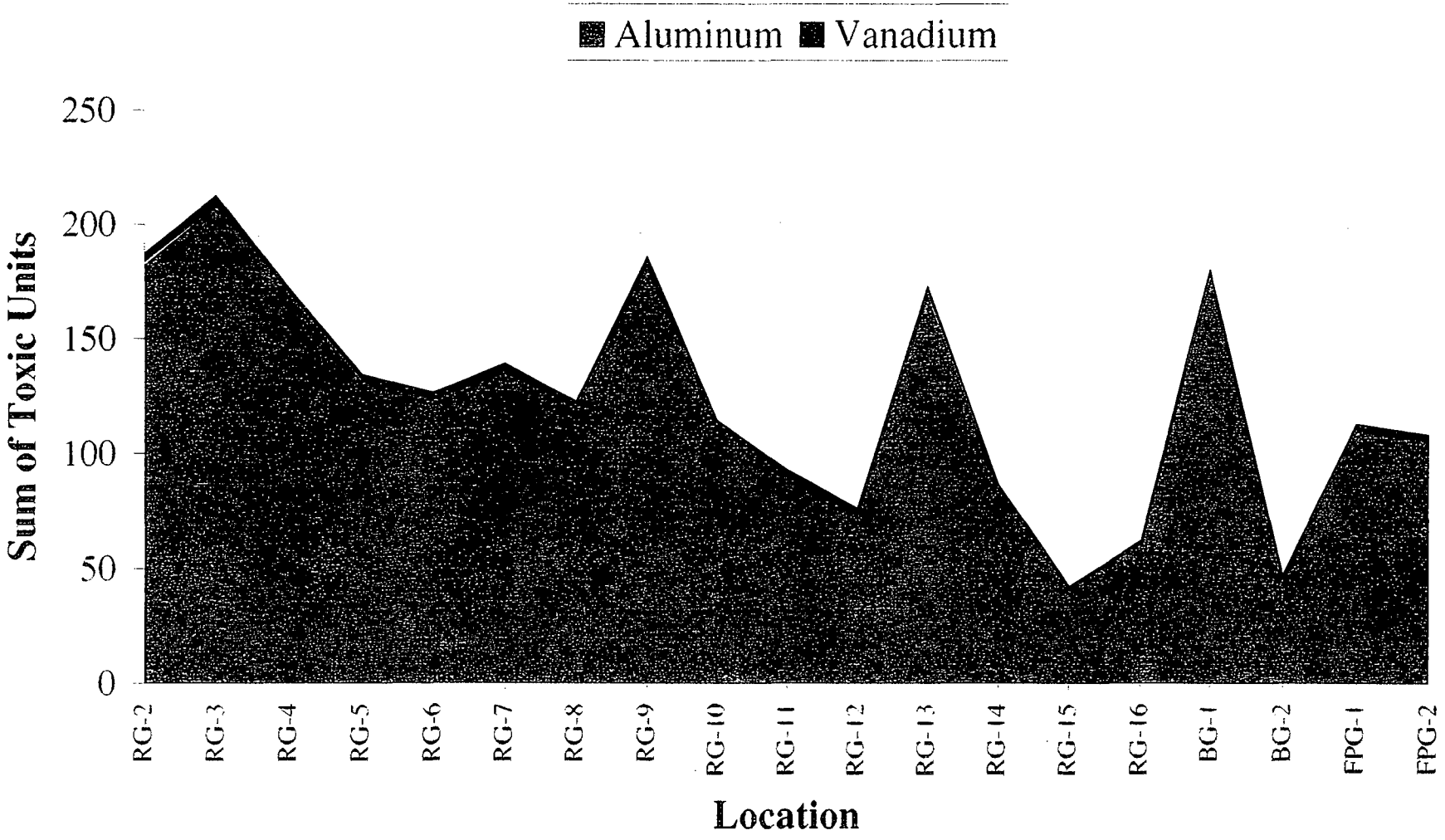
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Figure 6: Sum of Toxic Units for Plants in the Drainage Channels.



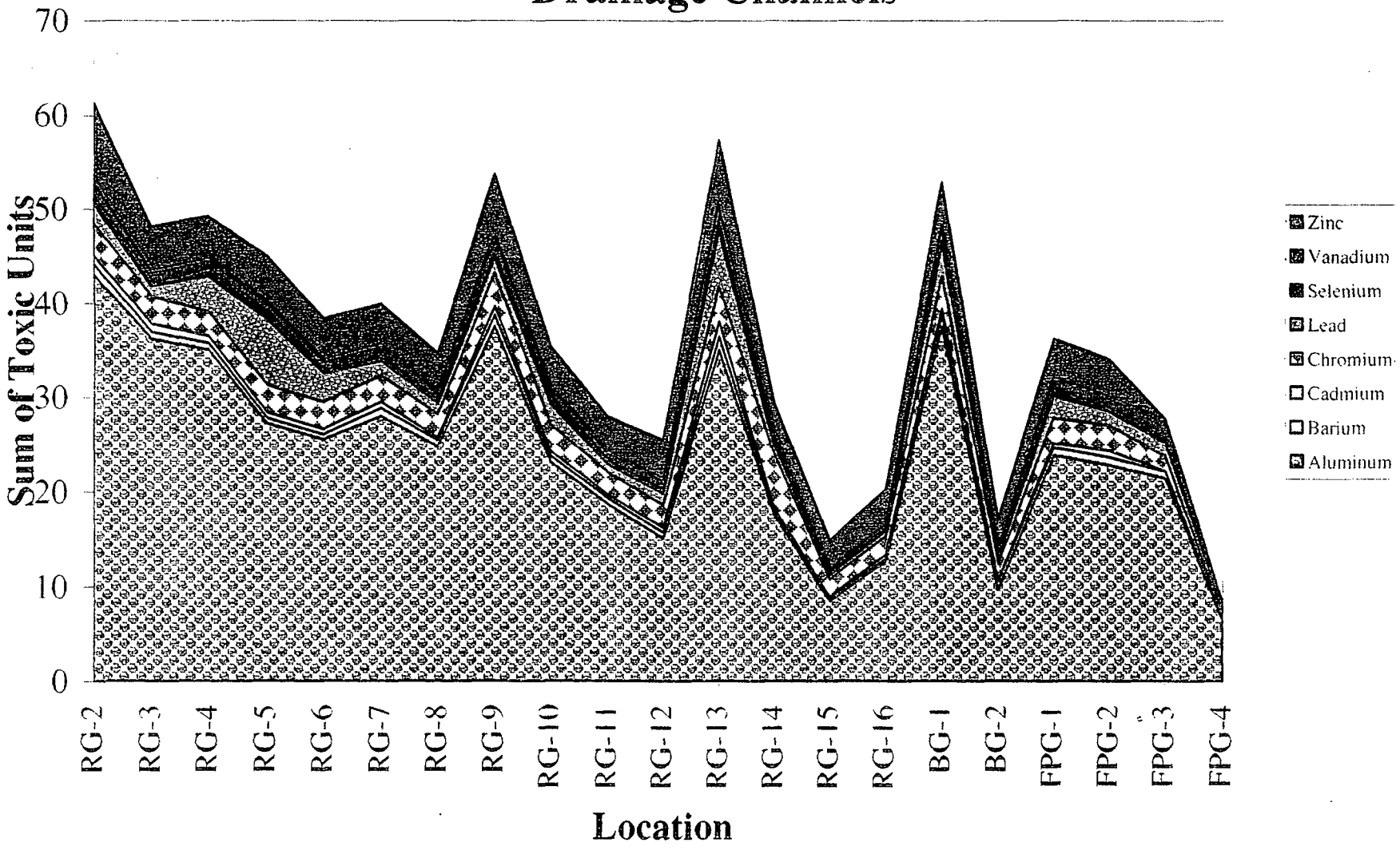
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Figure 7: Sum of Toxic Units for Goats Foraging in the Drainage Channels.



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Figure 8: Sum of Toxic Units for Sandpipers in the Drainage Channels



3041150

APPENDIX A

PHOTOGRAPHIC LOG

PHOTO NO.	DESCRIPTION
1	Virgin Island Asphalt Products Company located northwest of the Site
2	Virgin Island Asphalt Products Company located northwest of the Site
3	River Gut adjacent to Charlie's Concrete Company located southeast of the Site
4	River Gut adjacent to Charlie's Concrete Company located southeast of the Site
5	River Gut adjacent to Charlie's Concrete Company located southeast of the Site
6	River Gut adjacent to Charlie's Concrete Company located southeast of the Site
7	River Gut adjacent to Charlie's Concrete Company located southeast of the Site
8	River Gut adjacent to Charlie's Concrete Company located southeast of the Site
9	River Gut: Location RG-2
10	River Gut: Location RG-3
11	River Gut: Location RG-4
12	River Gut: Location RG-5
13	River Gut: Location RG-6
14	River Gut: Location RG-7
15	River Gut: Location RG-8 next to Charlie's Concrete Company
16	River Gut: Location RG-11
17	River Gut: Location RG-12
18	River Gut: Location RG-13
19	River Gut: Location RG-14 facing north
20	River Gut: Location RG-14 following rainstorm facing south
21	River Gut: Location RG-15 with debris from Charlie's Concrete Company
22	River Gut: Location RG-16
23	Bethlehem Gut: Location BG-1
24	Fair Plain Gut: Location FPG-2
25	Fair Plain Gut: Location FPG-3
26	Fair Plain Gut: Location FPG-4 upstream of Manning Bay
27	Manning Bay

PHOTO NO.	DESCRIPTION
28	Domesticated goats observed on the Site
29	River Gut northeast of Site west of Virgin Islands Paving Company
30	River Gut adjacent to the Virgin Islands Paving Company
31	Oily seep from Charlie's Concrete Company near Location RG-10
32	Oily seep from Charlie's Concrete Company near Location RG-10
33	Oily seep from Charlie's Concrete Company near Location RG-10

* All photographs taken in September 1997.

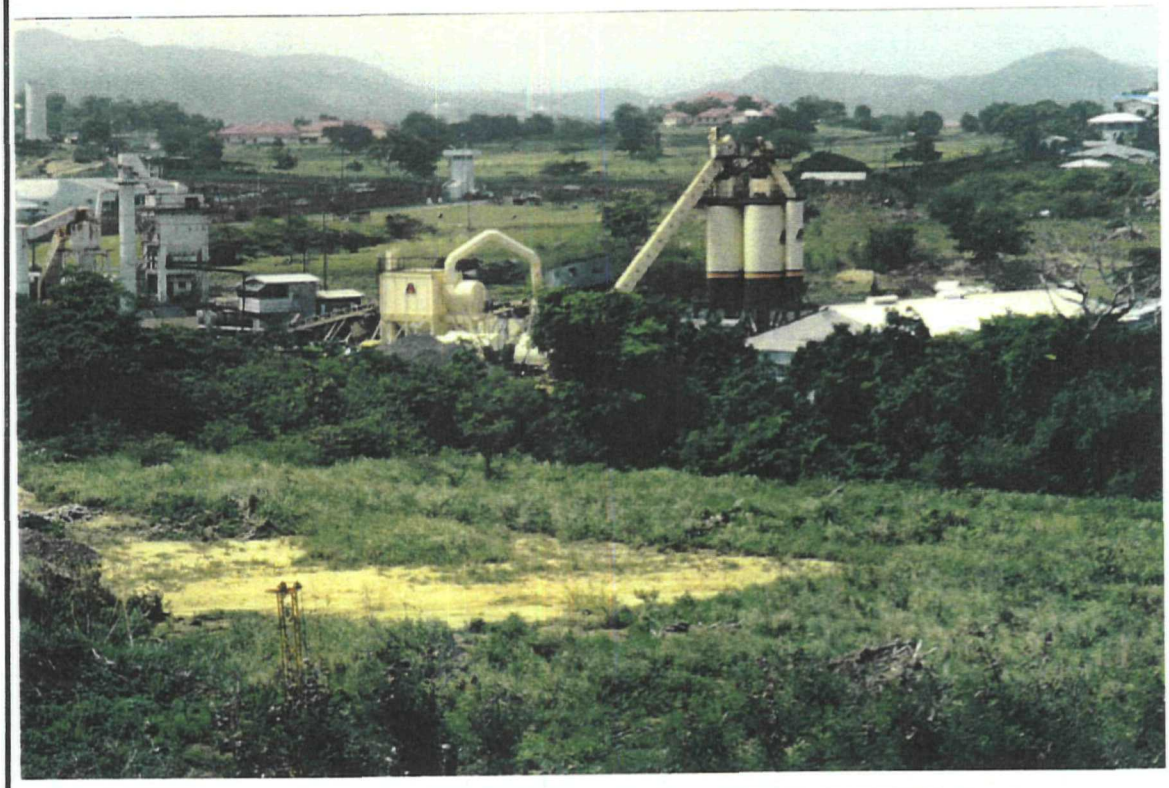


PHOTO 1: Virgin Island Asphalt Products Company located northwest of the Site.

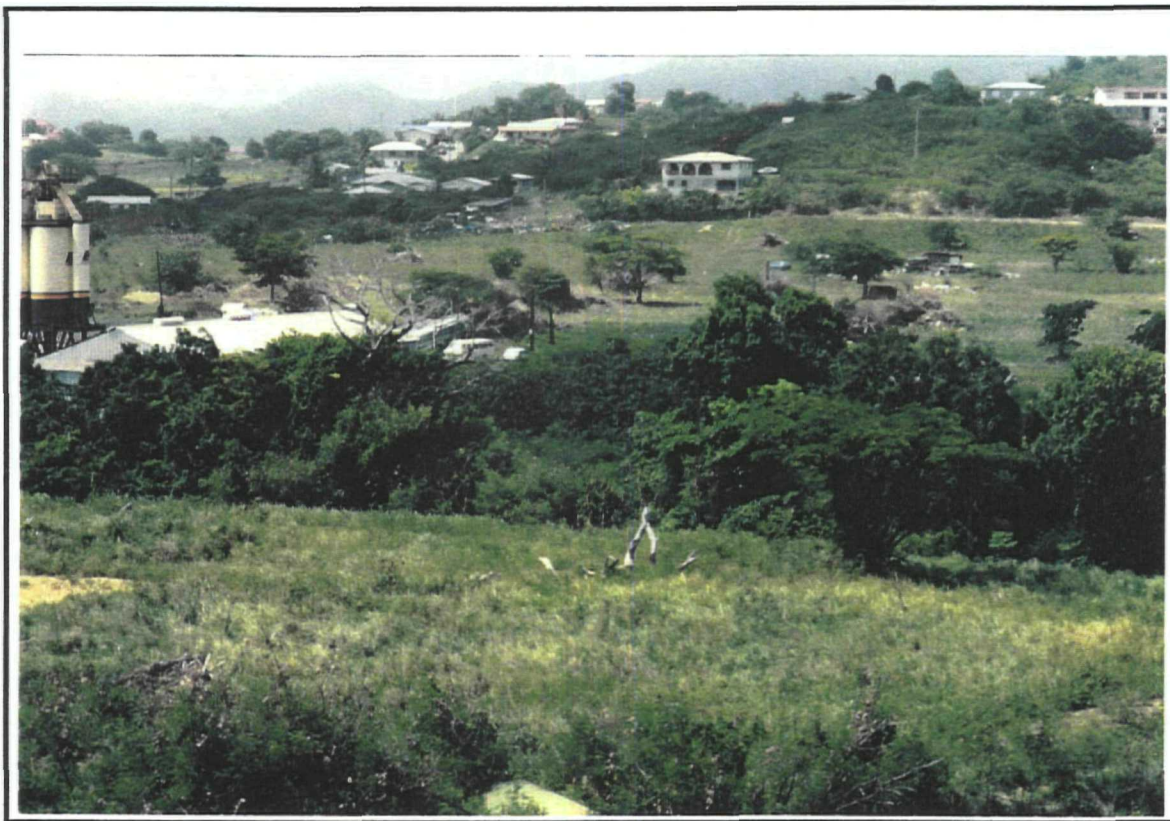


PHOTO 2: Virgin Island Asphalt Products Company located northwest of the Site.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 3: River Gut adjacent to Charlie's Concrete Company located southeast of the Site.

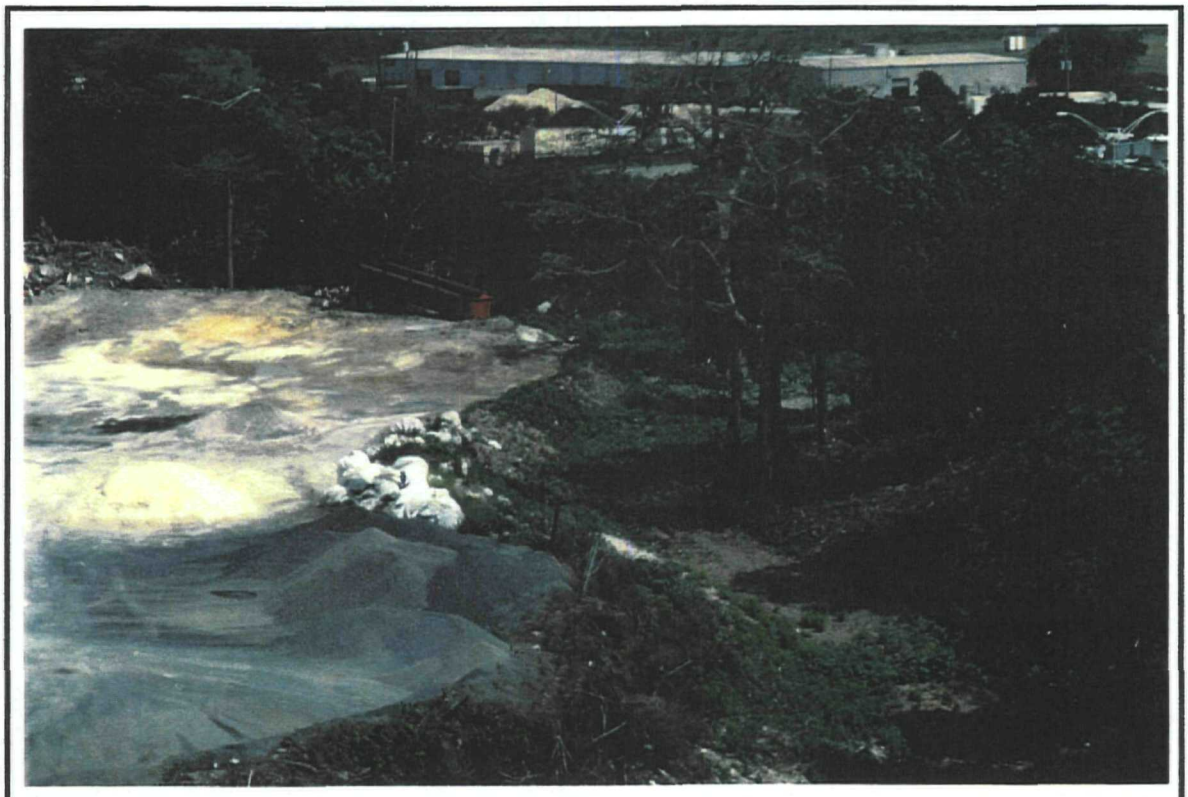


PHOTO 4: River Gut adjacent to Charlie's Concrete Company located southeast of the Site.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 5: River Gut adjacent to Charlie's Concrete Company located southeast of the Site.



PHOTO 6: River Gut adjacent to Charlie's Concrete Company located southeast of the Site.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 7: River Gut adjacent to Charlie's Concrete Company located southeast of the Site.



PHOTO 8: River Gut adjacent to Charlie's Concrete Company located southeast of the Site.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 9: River Gut: Location RG-2.



PHOTO 10: River Gut: Location RG-3

VIRGIN ISLAND CHEMICAL SITES
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PHOTO 11: River Gut: Location RG-4.



PHOTO 12: River Gut: Location RG-5.

VIRGIN ISLAND CHEMICAL SITE
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PHOTO 13: River Gut: Location RG-5.



PHOTO 14: River Gut: Location RG-7.

VIRGIN ISLAND CHEMICAL SITE
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PHOTO 15: River Gut: Location RG-8 next to Charlie's Concrete Company..



PHOTO 16: River Gut: Location RG-11.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 17: River Gut: Location RG-12.



PHOTO 18: River Gut: Location RG-13.

VIRGIN ISLAND CHEMICAL SITE
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PHOTO 19: River Gut: Location RG-14 facing north.



PHOTO 20: River Gut: Location RG-14 following rainstorm facing south.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 21: River Gut: Location RG-15 with debris from Charlie's Concrete Company.



PHOTO 22: River Gut: Location RG-16.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 23: Bethlehem Gut: Location BG-1.



PHOTO 24: Fair Plain Gut: Location FPG-2.

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SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 25: Fair Plain Gut: Location FPG-3.



PHOTO 26: Fair Plain Gut: Location FPG-4 upstream of Manning Bay.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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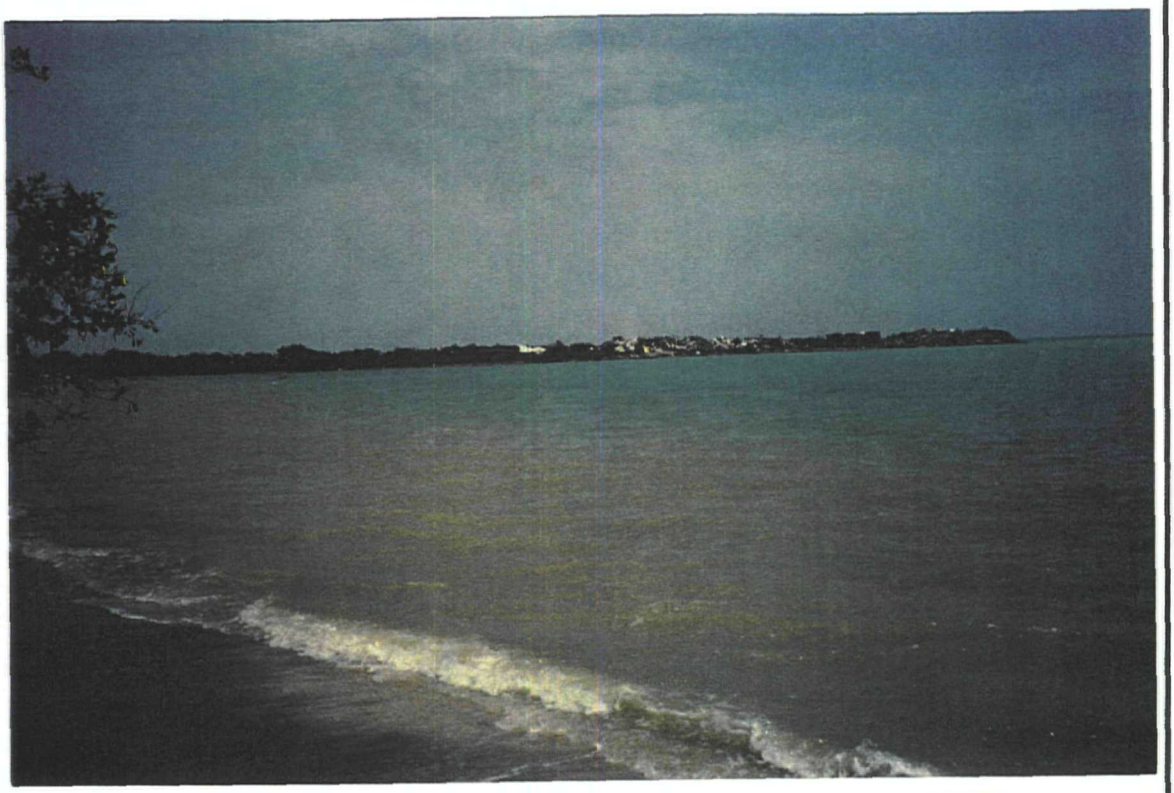


PHOTO 27: Manning Bay.



PHOTO 28: Domesticated goats observed on the Site.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 29: River Gut northeast of Site west of Virgin Island Paving Company.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 30. River Gut adjacent to the Virgin Islands Paving Company..

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 31: Oily seep from Charlie's Concrete Company near Location RG-10.



PHOTO 32: Oily seep from Charlie's Concrete Company near Location RG-10.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
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PHOTO 33: Oily seep from Charlie's Concrete Company near Location RG-10.

VIRGIN ISLAND CHEMICAL SITE
SCREENING ECOLOGICAL RISK ASSESSMENT
(PHOTOGRAPHED 9/97)
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APPENDIX B

FLORA AND FAUNA IDENTIFIED ON THE SITE

Table B-1: Flora Observed at the Virgin Island Chemical Site

Common Name	Scientific Name	Location Observed
Acacia	*Acacia Tortuosa*	Gut System
Baobab	*Adansonia digita*	Gut System
Bulrush, Soft Stem	*Scirpus validus*	Gut System
Cane, Sugar	*Saccharum officiali*	Gut System
Cattle tongue	Unknown	River Gut
Caper, Jamaican	*Capparis cynophallophora*	Gut System
Caper, Limber	*Capparis fleuosa*	River Gut
Caster-bean Tree	*Rincinis communis*	Gut System
Christmas Candle	*Pedilanthus tithymaloides*	River Gut
Day Flower, Virginia	*Commelina virginica*	Gut System
Dog-Almond	*Andera inermis*	Gut System
Flatsedge, Giant	*Cyperus gigantea*	Gut System
Grass, Annual Saltmarsh	*Aster subulatus*	Gut System
Grass, Barnyard	*Echinochloa crusgalli*	Gut System
Grass, Guinea	*Panicum maximum*	River Gut
Grass, India Goose	*Eleusine indica*	Gut System
Guava	*Psidium guajava*	Gut System
Haiti-Haiti	*Thespesia populnia*	Gut System
Kalanchoe	*Kalanchoe blossfeldiana*	River Gut
Limbo, Gumbo	*Bursera simaruba*	Gut System
Mango Tree	*Mangifera indica*	River Gut
Mangrove, Button	*Conocarpus erectus*	River and Fair Plain Guts
Mangrove, Black	*Avicennia germinans*	River and Fair Plain Guts
Mangrove, Red	*Rhizophora mangle*	River and Fair Plain Guts
Mangrove, White	*Laguncularia racemosa*	River and Fair Plain Guts
Monkey-no-climb	*Ceiba petandra*	River Gut
Paspalum, Cortardora	*Paspalum milligrana*	Gut System
Purple Queen	*Setcreasea pallida*	River Gut
Shrubs	*Acacious* sp.	River Gut
Spider Flower, Spiny	*Cleome spinosa*	Gut System
Spinach, Wild	*Amaranthus dubias*	Gut System
Tamarind	*Tamarindus indica*	Gut System
Tan Tan	*Leucaena glauca*	River Gut
Tibet	*Albizya lebbeck*	Gut System
Weed, Camphor	*Pluchea odorata*	Gut System
Windmillgrass, Swollen	*Chloris inflata*	Gut system

* Vegetation observed by HLA (1995ab), EPA Region II (1996b), and McLaren/Hart during the September 1997 site visit.

Table B-2: Possible Fauna at the Virgin Island Chemical Site

Common Name	Scientific Name	St. Croix Status
Mammals		
Bat, Jamaican Fruit	*Artibeus jamaicensis*	Nesting (breeding)
Bat, Cave	*Brachyphylla cavernarum*	Nesting (breeding)
Bat, Velvety free-tailed	*Molossus molossus (fortis)*	Nesting (breeding)
Bat, Fisherman	*Noctilio leporinus*	Nesting (breeding)
Deer, White-tailed	*Odocoileus virginianus*	Introduced
Mongoose, Small Indian	*Herpestes auropunctatus*	Introduced
Mouse, House	*Mus musculus*	Introduced
Rat, Roof	*Rattus rattus*	Introduced
Rat, Norway	*R. norveqicus*	Introduced
Birds		
Egret, Cattle	***Bubulcus ibis***	Nesting (breeding)
Heron, Great Blue	*Butorides virescens*	Sighted or Captured
Pied-billed Grebe	*Podilymbus podiceps*	Nesting (breeding)
Audubon's Shearwater	*P. lherminieri*	Sighted or Captured
Storm-Petrel, Leach's	*Oceanodroma leucorhoa*	Sighted or Captured
White-tailed Tropicbird	*Phaethon lepturus*	Nesting (breeding)
Brown Pelican	***P. occidentalis***	Nesting (breeding)
Brown Booby	*Sula leucogaster*	Sighted or Captured
Magnificent Frigatebird	*Fregata magnificens*	Sighted or Captured
Heron, Green	***Butorides virescens***	Nesting (breeding)
Heron, Little Blue	***Florida caerulea***	Nesting (breeding)
Egret, Reddish	*Dichromanassa rufescens*	Fewer than 16 sightings
Egret, Great (Common)	***Casmerodius (Egretta)***	Nesting (breeding)
Egret, Snowy	*Egretta (Leucophoyx) thula*	Nesting (breeding)
Heron, Louisiana	*Hydranassa tricolor*	Sighted or Captured
Night Heron, Black-crowned	*Nycticorax nyticorax*	Sighted or Captured
Yellow-crowned Night Heron	*Nyctanassa violacea*	Nesting (breeding)
American Bittern	*Botaurus lentiginosus*	Fewer than 16 sightings
Glossy Ibis	*Plegadis falcinellus*	Fewer than 16 sightings
American Flamingo	*Phoenicopterus ruber*	Fewer than 16 sightings
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*	Fewer than 16 sightings
Fulvous Whistling-Duck	*D. bicolor*	Fewer than 16 sightings
Mallard	*Anas platyrhynchos*	Fewer than 16 sightings
Pintail	*A. acuta*	Sighted or Captured
Bahama Duck	*A. bahamensis*	Nesting (breeding)
Green Winged (Common) Teal	*A. crecca*	Sighted or Captured
Blue-winged Teal	*A. discors*	Sighted or Captured
American Wigeon	*A. (Mareca) americana*	Sighted or Captured
Northern Shoveler	*A. (Spatula) clypeata*	Fewer than 16 sightings

Table B-2: Possible Fauna at the Virgin Island Chemical Site

Common Name	Scientific Name	St. Croix Status
Lesser Scaup	*A. affinis*	Sighted or Captured
Ruddy Duck	*Oxyura jamaicensis*	Sighted or Captured
Masked Duck	*O. dominica*	Fewer than 16 sightings
Hooded Merganser	*Lophodytes (Mergus) cucullatus*	Fewer than 16 sightings
Red-tailed Hawk	***Buteo jamaicensis***	Nesting (breeding)
Marsh Hawk	*Circus cyaneus*	Sighted or Captured
Osprey	*Pandion haliaetus*	Sighted or Captured
Peregrine Falcon	*Falco pereqrinus*	Sighted or Captured
Merlin (Pigeon Hawk)	*F. columbarius*	Sighted or Captured
American Kestrel (Sparrow Hawk)	*F. sparverius*	Nesting (breeding)
Bobwhite	*Colinus virginianus*	Introduced
Guinea-Fowl	*Numida meleagris*	Introduced
Clapper Rail	*Rallus longirostris*	Nesting (breeding)
Sora	*Porzana carolina*	Sighted or captured
Common Gallinule	***Gallinula chloropus***	Nesting (breeding)
American Coot	*Fulica americana*	Sighted or Captured
Carribean Coot	*F. caribea*	Nesting (breeding)
American Oystercatcher	*Haematopus palliatus (ostralequs)*	Sighted or Captured
Semipalmated Plover	*Charadrius semipalmatus*	Sighted or Captured
Snowy Plover	*C. alexandrinus*	Sighted or Captured
Wilson's Plover	*C. wilsonia*	Nesting (breeding)
Killdeer	*C. vociferus*	Nesting (breeding)
American Golden Plover	*Pluvialis dominica*	Fewer than 16 sightings
Black-bellied Plover	*P. (Squatarola) squatarola*	Sighted or Captured
Ruddy Turnstone	*Arenaria interpres*	Sighted or Captured
Common (Wilson's) Snipe	*Capella (Gallinago) gallinago*	Sighted or CAptured
Whimbrel	*Numenius phaeopus*	Sighted or Captured
Upland Sandpiper	*Bartramia longicauda*	Sighted or Captured
Spotted Sandpiper	*Actitis macularia*	Sighted or Captured
Solitary Sandpiper	*Tringa solitaria*	Sighted or Captured
Greater Yellowlegs	***Tringa (Totanus) melanoleuca***	Sighted or Captured
Lesser Yellowlegs	*Tringa (Totanus) flavipes*	Sighted or Captured
Willet	*Catoptrophorus semipalmatus*	Nesting (breeding)
Knot	*Calidris canutus*	Fewer than 16 sightings
Pectoral Sandpiper	*C. (Erolia) melanotos*	Sighted or Captured
White-rumped Sandpiper	*C. (E.) fuscicollis*	Sighted or Captured
Least Sandpiper	*C. (E.) minutilla*	Sighted or Captured
Semipalmated Sandpiper	*C. (Ereunetes) pusilla*	Sighted or Captured
Western Sandpiper	*C. (E.) mauri*	Sighted or Captured
Sanderling	*Calidris (Crocethia) alba*	Sighted or Captured
Short-billed Dowitcher	*Limnodromus griseus*	Sighted or Captured

Table B-2: Possible Fauna at the Virgin Island Chemical Site

Common Name	Scientific Name	St. Croix Status
Stilt Sandpiper	*Micropalama himantopus*	Sighted or Captured
Marbled Godwit	*Limosa fedoa*	Fewer than 16 sightings
American Avocet	*Recurvirostra americana*	Fewer than 16 sightings
Black-necked Stilt	*Himantopus mexicanus*	Nesting (breeding)
Herring Gull	*Larus argentatus*	Fewer than 16 sightings
Laughing Gull	*L. atricilla*	Sighted or Captured
Gull-billed Tern	*Gelochelidon milotica*	Sighted or Captured
Common Tern	*Sterna hirundo*	Fewer than 16 sightings
Roseate Tern	*Sterna dougallii*	Fewer than 16 sightings
Sooty Tern	*Sterna fuscata*	Sighted or Captured
Least Tern	*Sterna albifrons*	Nesting (breeding)
Royal Tern	*Sterna (Thalasseus) maxima*	Sighted or Captured
Sandwich Tern	*Sterna (Thalasseus) sandvicensis*	Fewer than 16 sightings
Noddy Tern	*Anous stolidus*	Sighted or Captured
Gull-billed Tern	*Gelochelidon nilotica*	Sighted or Captured
Common Tern	*Sterna hirundo*	Fewer than 16 sightings
Roseate Tern	*Sterna dougallii*	Fewer than 16 sightings
Sooty Tern	*Sterna fuscata*	Sighted or Captured
Least Tern	*Sterna albifrons*	Nesting (breeding)
Royal Tern	*S. (Thalasseus) maxima*	Sighted or Captured
Sandwich Tern	*S. T. sandvicensis*	Fewer than 16 sightings
White-Crowned Pigeon	***Columba leucocephala***	Nesting (breeding)
Scaly-naped Pigeon	*C. squamosa*	Nesting (breeding)
Rock Dove	***C. livia***	Introduced
White-winged Dove	*Zenaida aurita*	Fewer than 16 sightings
Spotted Dove	***Streptopelia chinensis***	Introduced
Ground Dove	***Columbina (Columbigallina) passerina***	Nesting (breeding)
Bridled Quail Dove	*Geotrygon mystacea*	Nesting (breeding)
Canary-winged Parakeet	*Brotogeris versicolorus*	Introduced
Hispaniolan Parrot	*Amazona ventralis*	Introduced
Mangrove Cuckoo	***Coccyzus minor***	Nesting (breeding)
Yellow-billed Cuckoo	*Coccyzus americanus*	Sighted or Captured
Smooth-billed Ani	***Crotophaga ani***	Nesting (breeding)
Puerto Rican Screech Owl	*Otus nudipes*	Sighted or Captured (Endemic)
Chuck-will's-widow	*Caprimulgus carolinensis*	Sighted or Captured
Common Nighthawk	*Chrodeiles minor*	Sighted or Captured
Black Swift	*Cypseloides niger*	Fewer than 16 sightings
Green-throated Carib	*Sericotes holosericeus*	Nesting (breeding)
Antillean Crested Hummingbird	*Orthorhyncus cristatus*	Nesting (breeding)

Table B-2: Possible Fauna at the Virgin Island Chemical Site

Common Name	Scientific Name	St. Croix Status
Belted Kingfisher	*Megaceryle (Ceryle) alcyon*	Sighted or Captured
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Sighted or Captured
Gray Kingbird	*Tyrannus dominicensis*	Nesting (breeding)
Caribbean Elaenia	*Elaenia martinica*	Nesting (breeding)
Barn Swallow	*Hirundo rustica*	Sighted or Captured
Cliff Swallow	*Petrochelidon pyrrhonota*	Fewer than 16 sightings
Cave Swallow	*P. fulva*	Fewer than 16 sightings
Caribbean Martin	*Progne dominicensis (subis)*	Nesting (breeding)
Mockingbird	***Mimus polyglottos***	Nesting (breeding)
Pearly-eyed Thrasher	***Margarops fuscatus***	Nesting (breeding)
Black-whiskered Vireo	***Vireo altiloguus***	Nesting (breeding)
Bananaquit	***Coereba flaveola (bahamensis***	Nesting (breeding)
Black-and-white Warbler	*Mniotilta varia*	Sighted or Captured
Prothonotary Warbler	*Protonotaria citrea*	Sighted or Captured
Worm-eating Warbler	*Helmitheros vermivorus*	Sighted or Captured
Northern Parula	*Parula americana*	Sighted or Captured
Yellow Warbler	***Dendroica petechia***	Nesting (breeding)
Cape May Warbler	*Dendroica tigrina*	Sighted or Captured
Black-throated Blue Warbler	*Dendroica caerulescens*	Sighted or Captured
Yellow-rumped (Myrtle) Warbler	*Dendroica coronata*	Sighted or Captured
Black-throated Green Warbler	*Dendroica virens*	Fewer than 16 sightings
Yellow-throated Warbler	*Dendroica dominica*	Fewer than 16 sightings
Bay-breasted Warbler	*Dendroica castanea*	Fewer than 16 sightings
Blackpoll Warbler	*Dendroica striata*	Sighted or Captured
Prairie Warbler	*Dendroica discolor*	Sighted or Captured
Palm Warbler	*Dendroica palmarun*	Sighted or Captured
Ovenbird	*Seiurus aurocapillus*	Sighted or Captured
Northern Waterthrush	*Seiurus noveboracensis*	Sighted or Captured
Louisiana Waterthrush	*Seiurus motacilla*	Sighted or Captured
Common Yellowthroat	*Geothlypis trichas*	Fewer than 16 sightings
Hooded Warbler	*Wilsonia citrina*	Fewer than 16 sightings
Canada Warbler	*Wilsonia canadensis*	Fewer than 16 sightings
American Redstart	*Setophaga ruticilla*	Sighted or Captured
Bobolink	*Dolichonyx oryzivorus*	Fewer than 16 sightings
Scarlet Tanager	*Piranga olivacea*	Fewer than 16 sightings
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Fewer than 16 sightings
Indigo Bunting	*Passerina cyanea*	Sighted or Captured
Black-faced Grassquit	***Tiaris bicolor***	Nesting (breeding)
Reptiles		
Red-footed tortoise	*Geochelone (testudo) carbonaria*	Introduced
Green Turtle	*Chelonia mydas*	Nesting (breeding)

Table B-2: Possible Fauna at the Virgin Island Chemical Site

Common Name	Scientific Name	St. Croix Status
Hawksbill	*Eretmochelys imbricata*	Nesting (breeding)
Leatherback	*Dermochelys coriacea*	Nesting (breeding)
Southern woodslave	*Hemidactylus mabouia*	Nesting (breeding)
Giant woodslave	*Thecadactylus rapicauda*	Nesting (breeding)
Cotton ginner	*Sphaerodactylus beattyi*	Nesting (breeding)
Common dwarf gecko	*Sphaerodactylus macrolepis*	Nesting (breeding)
St. Croix tree lizard	***Anolis acutus***	Nesting (breeding)
Common iguana	*Iguana iguana*	Nesting (breeding)
St. Croix ground lizard	*Ameiva polops*	Nesting (breeding)
Common worm snake	*Typhlopidae richardi*	Nesting (breeding)

BOLD : Observed on-site or in gut system.

Source: Annotated checklist of the Birds, Mammalss, Reptiles, and Amphibians of the Virgin Islands & Puerto Rico (Philibosian and Yntema, 1977)

APPENDIX C

SCREENING EVALUATION TABLES

Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Phytotoxicity Benchmark[a] (mg/kg)	Hazard Quotient
RG-2	Aluminum	15500		50	**310.00**
	Antimony	0.53	U	5	--
	Arsenic	1.6	BJ	10	0.16
	Barium	70.6		500	0.14
	Beryllium	0.03	U	10	--
	Cadmium	0.19	BJ	3	0.06
	Calcium	24500		NA	--
	Chromium	16.1		1	**16.10**
	Cobalt	14.8	J	20	0.74
	Copper	40.5	J	100	0.41
	Iron	26800		NA	--
	Lead	5.9	J	50	0.12
	Magnesium	7650		NA	--
	Manganese	594	J	500	**1.19**
	Mercury	0.13	U	0.3	--
	Nickel	9.4	B	30	0.31
	Potassium	2230	J	NA	--
	Selenium	0.68	B	1	0.68
	Silver	0.16	U	2	--
	Sodium	543	B	NA	--
	Thallium	0.58	U	1	--
	Vanadium	69.2		2	**34.60**
	Zinc	140	J	50	**2.80**
	Cyanide	1.3	U	NA	--
RG-2D	Aluminum	17700		50	**354.00**
	Antimony	0.52	U	5	--
	Arsenic	0.34	U	10	--
	Barium	89		500	0.18
	Beryllium	0.03	U	10	--
	Cadmium	0.3	B	3	0.10
	Calcium	28700		NA	--
	Chromium	19.4		1	**19.40**
	Cobalt	16.8	J	20	0.84
	Copper	54.4	J	100	0.54
	Iron	30900		NA	--
	Lead	8.2	J	50	0.16
	Magnesium	9070		NA	--
	Manganese	675	J	500	**1.35**
	Mercury	0.13	U	0.3	--
	Nickel	13.8	J	30	0.46
	Potassium	3300	J	NA	--
	Selenium	0.65	U	1	--
	Silver	0.16	U	2	--
	Sodium	697	B	NA	--
	Thallium	0.57	U	1	--
	Vanadium	81		2	**40.50**
	Zinc	263	J	50	**5.26**
	Cyanide	1.3	U	NA	--

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Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
RG-3	Aluminum	14900		50	**298.00**
	Antimony	0.53	U	5	--
	Arsenic	0.86	BJ	10	0.09
	Barium	53.8		500	0.11
	Beryllium	0.03	U	10	--
	Cadmium	0.31	B	3	0.10
	Calcium	39300		NA	--
	Chromium	14.8		1	**14.80**
	Cobalt	13.8	J	20	0.69
	Copper	38.8	J	100	0.39
	Iron	27300		NA	--
	Lead	4.1	J	50	0.08
	Magnesium	8600		NA	--
	Manganese	792	J	500	**1.58**
	Mercury	0.13	U	0.3	--
	Nickel	10.3	B	30	0.34
	Potassium	1500	J	NA	--
	Selenium	0.66	U	1	--
	Silver	0.16	U	2	--
	Sodium	525	B	NA	--
	Thallium	0.58	U	1	--
	Vanadium	59.6		2	**29.80**
	Zinc	54.4	J	50	**1.09**
	Cyanide	1.3	U	NA	--
RG-4	Aluminum	14400		50	**288.00**
	Antimony	0.49	U	5	--
	Arsenic	1.2	BJ	10	0.12
	Barium	58.4		500	0.12
	Beryllium	0.02	U	10	--
	Cadmium	0.21	B	3	0.07
	Calcium	51000		NA	--
	Chromium	12		1	**12.00**
	Cobalt	12.8	J	20	0.64
	Copper	33	J	100	0.33
	Iron	22700		NA	--
	Lead	14.1	J	50	0.28
	Magnesium	6920		NA	--
	Manganese	726	J	500	**1.45**
	Mercury	0.33		0.3	**1.10**
	Nickel	9.8	J	30	0.33
	Potassium	1310	J	NA	--
	Selenium	0.61	U	1	0.61
	Silver	0.15	U	2	0.08
	Sodium	639	B	NA	--
	Thallium	0.54	U	1	--
	Vanadium	49.2		2	**24.60**
	Zinc	50.8	J	50	**1.02**
	Cyanide	1.2	U	NA	--

Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
RG-4D	Aluminum	9210		50	**184.20**
	Antimony	0.53	U	5	--
	Arsenic	0.34	U	10	--
	Barium	36.3	B	500	0.07
	Beryllium	0.03	U	10	--
	Cadmium	0.11	B	3	0.04
	Calcium	30700		NA	--
	Chromium	8		1	**8.00**
	Cobalt	8	BJ	20	0.40
	Copper	19.6	J	100	0.20
	Iron	14500		NA	--
	Lead	3.1	J	50	0.06
	Magnesium	4700		NA	--
	Manganese	445	J	500	0.89
	Mercury	0.19	J	0.3	0.63
	Nickel	6.1	B	30	0.20
	Potassium	754	B	NA	--
	Selenium	1	B	1	**1.00**
	Silver	0.16	U	2	--
	Sodium	509	B	NA	--
	Thallium	0.58	U	1	--
	Vanadium	32.7		2	**16.35**
	Zinc	42.6	J	50	0.85
	Cyanide	1.3	U	NA	--
RG-5	Aluminum	11200		50	**224.00**
	Antimony	0.47	U	5	--
	Arsenic	0.91	BJ	10	0.09
	Barium	43.5	B	500	0.09
	Beryllium	0.02	U	10	--
	Cadmium	0.15	B	3	0.05
	Calcium	81100		NA	--
	Chromium	14.6		1	**14.60**
	Cobalt	10.3	BJ	20	0.52
	Copper	32.9	J	100	0.33
	Iron	22300		NA	--
	Lead	26.1	J	50	0.52
	Magnesium	7630		NA	--
	Manganese	598	J	500	**1.20**
	Mercury	0.13	J	0.3	0.43
	Nickel	9.6	J	30	0.32
	Potassium	1290	J	NA	--
	Selenium	0.98	B	1	0.98
	Silver	0.14	U	2	--
	Sodium	580	B	NA	--
	Thallium	0.52	U	1	--
	Vanadium	48.1		2	**24.05**
	Zinc	67.8	J	50	**1.36**
	Cyanide	1.2	U	NA	--

Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
RG-6	Aluminum	10500		50	**210.00**
	Antimony	0.46	U	5	--
	Arsenic	0.36	BJ	10	0.04
	Barium	43.5	B	500	0.09
	Beryllium	0.02	U	10	--
	Cadmium	0.13	B	3	0.04
	Calcium	57000		NA	--
	Chromium	14.4		1	**14.40**
	Cobalt	9.5	BJ	20	0.48
	Copper	29.6	J	100	0.30
	Iron	19800		NA	--
	Lead	11.4	J	50	0.23
	Magnesium	6700		NA	--
	Manganese	513	J	500	**1.03**
	Mercury	0.22	J	0.3	0.73
	Nickel	10.6	J	30	0.35
	Potassium	1250	J	NA	--
	Selenium	0.57	U	1	--
	Silver	0.14	U	2	--
	Sodium	474	B	NA	--
	Thallium	0.51	U	1	--
	Vanadium	51.4		2	**25.70**
	Zinc	45.9	J	50	0.92
	Cyanide	1.1	U	NA	--
RG-7	Aluminum	11500		50	**230.00**
	Antimony	0.53	U	5	--
	Arsenic	0.92	BJ	10	0.09
	Barium	68		500	0.14
	Beryllium	0.03	U	10	--
	Cadmium	0.19	B	3	0.06
	Calcium	42900		NA	--
	Chromium	13.6		1	**13.60**
	Cobalt	11	BJ	20	0.55
	Copper	34.1	J	100	0.34
	Iron	21100		NA	--
	Lead	5.9	J	50	0.12
	Magnesium	6040		NA	--
	Manganese	531	J	500	**1.06**
	Mercury	0.11	U	0.3	--
	Nickel	8.2	B	30	0.27
	Potassium	1750	J	NA	--
	Selenium	0.66	U	1	--
	Silver	0.16	U	2	--
	Sodium	479	B	NA	--
	Thallium	0.58	U	1	--
	Vanadium	63.8		2	**31.90**
	Zinc	43.4	J	50	0.87
	Cyanide	1.3	U	NA	--

Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
RG-8	Aluminum	10200		50	**204.00**
	Antimony	0.48	U	5	--
	Arsenic	0.31	U	10	--
	Barium	53		500	0.11
	Beryllium	0.02	U	10	--
	Cadmium	0.03	B	3	--
	Calcium	48700		NA	--
	Chromium	10.8		1	**10.80**
	Cobalt	8.1	BJ	20	0.41
	Copper	25.1	J	100	0.25
	Iron	15800		NA	--
	Lead	4.5	J	50	0.09
	Magnesium	5320		NA	--
	Manganese	408	J	500	0.82
	Mercury	0.19	J	0.3	0.63
	Nickel	6.5	B	30	0.22
	Potassium	1910	J	NA	--
	Selenium	0.6	U	1	--
	Silver	0.14	U	2	--
	Sodium	522	B	NA	--
	Thallium	0.52	U	1	--
	Vanadium	44.8		2	**22.40**
	Zinc	34.9	J	50	0.70
	Cyanide	1.2	U	NA	--
RG-9	Aluminum	15400		50	**308.00**
	Antimony	0.56	U	5	--
	Arsenic	1.1	BJ	10	0.11
	Barium	98.5		500	0.20
	Beryllium	0.03	U	10	--
	Cadmium	0.32	B	3	0.11
	Calcium	56200		NA	--
	Chromium	20.2		1	**20.20**
	Cobalt	14.4	J	20	0.72
	Copper	47.2	J	100	0.47
	Iron	27500		NA	--
	Lead	6.3	J	50	0.13
	Magnesium	8270		NA	--
	Manganese	708	J	500	**1.42**
	Mercury	0.34	J	0.3	**1.13**
	Nickel	12.4	J	30	0.41
	Potassium	3540	J	NA	--
	Selenium	0.69	U	1	--
	Silver	0.17	U	2	--
	Sodium	668	B	NA	--
	Thallium	0.61	U	1	--
	Vanadium	85.9		2	**42.95**
	Zinc	155	J	50	**3.10**
	Cyanide	1.4	U	NA	--

Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
RG-10	Aluminum	9500		50	**190.00**
	Antimony	0.52	U	5	--
	Arsenic	1	BJ	10	0.10
	Barium	52.6		500	0.11
	Beryllium	0.03	U	10	--
	Cadmium	0.11	B	3	0.04
	Calcium	56700		NA	--
	Chromium	13.9		1	**13.90**
	Cobalt	7.4	BJ	20	0.37
	Copper	23.7	J	100	0.24
	Iron	16000		NA	--
	Lead	8.2	J	50	0.16
	Magnesium	4610		NA	--
	Manganese	431	J	500	0.86
	Mercury	0.25	J	0.3	0.83
	Nickel	7.6	B	30	0.25
	Potassium	1650	J	NA	--
	Selenium	1.1	B	1	**1.10**
	Silver	0.16	U	2	--
	Sodium	599	B	NA	--
	Thallium	0.57	U	1	--
	Vanadium	46.3		2	**23.15**
	Zinc	44	J	50	0.88
	Cyanide	1.3	U	NA	--
RG-11	Aluminum	7680		50	**153.60**
	Antimony	0.49	U	5	--
	Arsenic	0.38	BJ	10	0.04
	Barium	50.6		500	0.10
	Beryllium	0.02	U	10	--
	Cadmium	0.05	B	3	0.02
	Calcium	32000		NA	--
	Chromium	10.1		1	**10.10**
	Cobalt	6.7	BJ	20	0.34
	Copper	22	J	100	0.22
	Iron	12700		NA	--
	Lead	3.4	J	50	0.07
	Magnesium	3590		NA	--
	Manganese	297	J	500	0.59
	Mercury	0.39	J	0.3	**1.30**
	Nickel	5.6	B	30	0.19
	Potassium	1410	J	NA	--
	Selenium	0.62	U	1	--
	Silver	0.15	U	2	--
	Sodium	329	B	NA	--
	Thallium	0.54	U	1	--
	Vanadium	44.5		2	**22.25**
	Zinc	26.4	J	50	0.53
	Cyanide	1.2	U	NA	--

Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
RG-12	Aluminum	6210		50	**124.20**
	Antimony	0.49	U	5	--
	Arsenic	0.48	BJ	10	0.05
	Barium	47	B	500	0.09
	Beryllium	0.02	U	10	--
	Cadmium	0.12	B	3	0.04
	Calcium	23900		NA	--
	Chromium	9.9		1	**9.90**
	Cobalt	6.1	BJ	20	0.31
	Copper	18.1	J	100	0.18
	Iron	12500		NA	--
	Lead	4.7	J	50	0.09
	Magnesium	2560		NA	--
	Manganese	313	J	500	0.63
	Mercury	0.11	U	0.3	--
	Nickel	4.2	B	30	0.14
	Potassium	1010	B	NA	--
	Selenium	0.61	U	1	--
	Silver	0.15	U	2	--
	Sodium	293	B	NA	--
	Thallium	0.54	U	1	--
	Vanadium	53		2	**26.50**
	Zinc	39.1	J	50	0.78
	Cyanide	1.2	U	NA	--
RG-13	Aluminum	14400		50	**288.00**
	Antimony	0.47	U	5	--
	Arsenic	1.1	BJ	10	0.11
	Barium	112		500	0.22
	Beryllium	0.02	U	10	--
	Cadmium	0.86	B	3	0.29
	Calcium	57400		NA	--
	Chromium	21.6		1	**21.60**
	Cobalt	11.9	J	20	0.60
	Copper	43.8	J	100	0.44
	Iron	23100		NA	--
	Lead	22.2	J	50	0.44
	Magnesium	6600		NA	--
	Manganese	560	J	500	**1.12**
	Mercury	0.11	U	0.3	--
	Nickel	11.5	J	30	0.38
	Potassium	3020	J	NA	--
	Selenium	1.6		1	**1.60**
	Silver	0.14	U	2	--
	Sodium	561	B	NA	--
	Thallium	0.51	U	1	--
	Vanadium	70.2		2	**35.10**
	Zinc	174	J	50	**3.48**
	Cyanide	1.2	U	NA	--

Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
RG-14	Aluminum	7220	J	50	**144.40**
	Antimony	0.83	U	5	--
	Arsenic	1.5	BJ	10	0.15
	Barium	36.5	BJ	500	0.07
	Beryllium	0.04	U	10	--
	Cadmium	0.04	U	3	--
	Calcium	97500	J	NA	--
	Chromium	39	J	1	**39.00**
	Cobalt	4.9	BJ	20	0.25
	Copper	10.2	BJ	100	0.10
	Iron	9160	J	NA	--
	Lead	3.4	J	50	0.07
	Magnesium	3190	J	NA	--
	Manganese	222	J	500	0.44
	Mercury	0.18	U	0.3	--
	Nickel	17	J	30	0.57
	Potassium	706	BJ	NA	--
	Selenium	1	U	1	--
	Silver	0.25	U	2	--
	Sodium	215	BJ	NA	--
	Thallium	0.92	U	1	--
	Vanadium	28.6	J	2	**14.30**
	Zinc	21.8	J	50	0.44
	Cyanide	2	U	NA	--
RG-15	Aluminum	3500		50	**70.00**
	Antimony	0.46	U	5	--
	Arsenic	0.3	U	10	--
	Barium	23.1	B	500	0.05
	Beryllium	0.02	U	10	--
	Cadmium	0.02	U	3	--
	Calcium	800000		NA	--
	Chromium	4.7		1	**4.70**
	Cobalt	2.2	BJ	20	0.11
	Copper	11.8	J	100	0.12
	Iron	4330		NA	--
	Lead	1.6	J	50	0.03
	Magnesium	1600		NA	--
	Manganese	173	J	500	0.35
	Mercury	0.11	J	0.3	0.37
	Nickel	1.3	B	30	0.04
	Potassium	665	B	NA	--
	Selenium	0.57	U	1	--
	Silver	0.14	U	2	--
	Sodium	255	B	NA	--
	Thallium	0.51	U	1	--
	Vanadium	15		2	**7.50**
	Zinc	13.6	J	50	0.27
	Cyanide	1.1	U	NA	--

Table C-1: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
RG-16	Aluminum	5200		50	**104.00**
	Antimony	0.53	U	5	--
	Arsenic	0.34	U	10	--
	Barium	21.6	B	500	0.04
	Beryllium	0.03	U	10	--
	Cadmium	0.08	B	3	0.03
	Calcium	46400		NA	--
	Chromium	5.9		1	**5.90**
	Cobalt	3.1	BJ	20	0.16
	Copper	19.9	J	100	0.20
	Iron	5780		NA	--
	Lead	2.2	J	50	0.04
	Magnesium	1660		NA	--
	Manganese	196	J	500	0.39
	Mercury	0.12	U	0.3	--
	Nickel	4.2	B	30	0.14
	Potassium	803	B	NA	--
	Selenium	0.66	U	1	--
	Silver	0.16	U	2	--
	Sodium	492	B	NA	--
	Thallium	0.58	U	1	--
	Vanadium	17		2	**8.50**
	Zinc	25.9	J	50	0.52
	Cyanide	1.3	U	NA	--
Average in River Gut	Aluminum	10836.47		50	**216.73**
	Antimony	0.26		5	0.05
	Arsenic	0.72		10	0.07
	Barium	56.35		500	0.11
	Beryllium	0.01		10	0.00
	Cadmium	0.19		3	0.06
	Calcium	92588.24		NA	--
	Chromium	14.65		1	**14.65**
	Cobalt	9.52		20	0.48
	Copper	29.69		100	0.30
	Iron	18368.82		NA	--
	Lead	7.96		50	0.16
	Magnesium	5571.18		NA	--
	Manganese	481.29		500	0.96
	Mercury	0.16		0.3	0.52
	Nickel	8.71		30	0.29
	Potassium	1652.82		NA	--
	Selenium	0.55		1	0.55
	Silver	0.08		2	0.04
	Sodium	492.94		NA	--
	Thallium	0.29		1	0.29
	Vanadium	50.61		2	**25.30**
	Zinc	73.09		50	1.46
	Cyanide	0.64		NA	--

Concentrations and benchmarks are in mg/kg.

[a] Phytotoxicity Benchmarks (Efroymson et al., 1997)

U = Analyte was not detected above the referenced reporting limit.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated; nondetect concentration or benchmark not available.

NA: Not available

Average chemical concentration within the River Gut was calculated using 1/2 the detection limit if the chemical was not detected. Hazard quotients are presented even if chemical was not detected in all samples.

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Table C-2: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Phytotoxicity Benchmark[a] (mg/kg)	Hazard Quotient
BG-1	Aluminum	15400		50	**308.00**
	Antimony	0.61	U	5	--
	Arsenic	0.39	U	10	--
	Barium	101		500	0.20
	Beryllium	0.03	U	10	--
	Cadmium	0.16	B	3	0.05
	Calcium	39800		NA	--
	Chromium	19.7		1	**19.70**
	Cobalt	11.4	BJ	20	0.57
	Copper	49.3	J	100	0.49
	Iron	20400		NA	--
	Lead	12.9	J	50	0.26
	Magnesium	5380		NA	--
	Manganese	534	J	500	**1.07**
	Mercury	0.14	U	0.3	--
	Nickel	11.7	B	30	0.39
	Potassium	3310	J	NA	--
	Selenium	0.76	U	1	--
	Silver	0.18	U	2	--
	Sodium	660	B	NA	--
	Thallium	0.67	U	1	--
	Vanadium	68.2		2	**34.10**
	Zinc	58.7	J	50	**1.17**
	Cyanide	1.5	U	NA	--
BG-2	Aluminum	3990		50	**79.80**
	Antimony	0.43	U	5	--
	Arsenic	0.43	BJ	10	0.04
	Barium	63		500	0.13
	Beryllium	0.02	U	10	--
	Cadmium	0.02	U	3	--
	Calcium	19800		NA	--
	Chromium	4.6		1	**4.60**
	Cobalt	5.4	BJ	20	0.27
	Copper	11.2	J	100	0.11
	Iron	5300		NA	--
	Lead	2.4	J	50	0.05
	Magnesium	1150		NA	--
	Manganese	339	J	500	0.68
	Mercury	0.1	U	0.3	--
	Nickel	3.2	B	30	0.11
	Potassium	582	B	NA	--
	Selenium	0.53	U	1	--
	Silver	0.13	U	2	--
	Sodium	423	B	NA	--
	Thallium	0.47	U	1	--
	Vanadium	29.9		2	**14.95**

Table C-2: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
BG-2	Zinc	13.1	J	50	0.26
	Cyanide	1.1	U	NA	--
Average in Bethlehem Gut	Aluminum	9695		50	**193.90**
	Antimony	0.26		5	0.05
	Arsenic	0.3125		10	0.03
	Barium	82		500	0.16
	Beryllium	0.0125		10	0.00
	Cadmium	0.085		3	0.03
	Calcium	29800		NA	--
	Chromium	12.15		1	**12.15**
	Cobalt	8.4		20	0.42
	Copper	30.25		100	0.30
	Iron	12850		NA	--
	Lead	7.65		50	0.15
	Magnesium	3265		NA	--
	Manganese	436.5		500	0.87
	Mercury	0.06		0.3	0.20
	Nickel	7.45		30	0.25
	Potassium	1946		NA	--
	Selenium	0.3225		1	0.32
	Silver	0.0775		2	0.04
	Sodium	541.5		NA	--
	Thallium	0.285		1	0.29
	Vanadium	49.05		2	**24.53**
	Zinc	35.9		50	0.72
	Cyanide	0.65		NA	--

Concentrations and benchmarks are in mg/kg.

[a] Phytotoxicity Benchmarks (Efroymson et al., 1997)

U = Analyte was not detected above the referenced reporting limit.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated; nondetect concentration or benchmark not available.

NA: Not available

Average chemical concentration within the River Gut was calculated using 1/2 the detection limit if the chemical was not detected. Hazard quotients are presented even if chemical was not detected in all samples.

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Table C-3: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
Fair Plain Gut- Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Phytotoxicity Benchmark[a] (mg/kg)	Hazard Quotient
FPG-1	Aluminum	10200		50	**204.00**
	Antimony	0.52	U	5	--
	Arsenic	1.4	BJ	10	0.14
	Barium	67.4		500	0.13
	Beryllium	0.03	U	10	--
	Cadmium	0.09	B	3	0.03
	Calcium	36600		NA	--
	Chromium	13.9		1	**13.90**
	Cobalt	8.2	BJ	20	0.41
	Copper	33.1	J	100	0.33
	Iron	14300		NA	--
	Lead	8.8	J	50	0.18
	Magnesium	3680		NA	--
	Manganese	267	J	500	0.53
	Mercury	0.13	U	0.3	--
	Nickel	7.7	B	30	0.26
	Potassium	2150	J	NA	--
	Selenium	1.1	B	1	**1.10**
	Silver	0.16	U	2	--
	Sodium	570	B	NA	--
	Thallium	0.57	U	1	--
	Vanadium	54.6		2	**27.30**
	Zinc	39.4	J	50	0.79
	Cyanide	1.3	U	NA	--
FPG-2	Aluminum	9750		50	**195.00**
	Antimony	0.51	U	5	--
	Arsenic	2.8	J	10	0.28
	Barium	70		500	0.14
	Beryllium	0.03	U	10	--
	Cadmium	0.2	B	3	0.07
	Calcium	25300		NA	--
	Chromium	13.9		1	**13.90**
	Cobalt	8.6	BJ	20	0.43
	Copper	33.2	J	100	0.33
	Iron	14800		NA	--
	Lead	5.7	J	50	0.11
	Magnesium	3670		NA	--
	Manganese	332	J	500	0.66
	Mercury	0.12	U	0.3	--
	Nickel	6.9	B	30	0.23
	Potassium	1940	J	NA	--
	Selenium	0.63	U	1	--
	Silver	0.15	U	2	--
	Sodium	887	B	NA	--
	Thallium	0.56	U	1	--
	Vanadium	56.5		2	**28.25**

Table C-3: Chemical Concentrations Measured in Surface Soil Compared to Phytotoxicity Benchmarks
Fair Plain Gut- Virgin Island Chemical Site

Location	Analyte	Concentration	Qualifier	Phytotoxicity Benchmark[a]	Hazard Quotient
FPG-2	Zinc	34.2	J	50	0.68
	Cyanide	1.2	U	NA	--
Average in Fairplain Gut	Aluminum	9975		50	**199.50**
	Antimony	0.2575		5	0.05
	Arsenic	2.1		10	0.21
	Barium	68.7		500	0.14
	Beryllium	0.015		10	0.00
	Cadmium	0.145		3	0.05
	Calcium	30950		NA	--
	Chromium	13.9		1	**13.90**
	Cobalt	8.4		20	0.42
	Copper	33.15		100	0.33
	Iron	14550		NA	--
	Lead	7.25		50	0.15
	Magnesium	3675		NA	--
	Manganese	299.5		500	0.60
	Mercury	0.0625		0.3	0.21
	Nickel	7.3		30	0.24
	Potassium	2045		NA	--
	Selenium	0.7075		1	0.71
	Silver	0.0775		2	0.04
	Sodium	728.5		NA	--
	Thallium	0.2825		1	0.28
	Vanadium	55.55		2	**27.78**
	Zinc	36.8		50	0.74
	Cyanide	0.625		NA	--

Notes:
Concentrations and benchmarks are in mg/kg.

[a] Phytotoxicity Benchmarks (Efroymson et al., 1997)

U = Analyte was not detected above the referenced reporting limit.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated; nondetect concentration or benchmark not available.

NA: Not available

Average chemical concentration within the River Gut was calculated using 1/2 the detection limit if the chemical was not detected. Hazard quotients are presented even if chemical was not detected in all samples.

Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d) Food	Soil	Total	NOAEL Benchmark	NOAEL HQ
RG-2	Aluminum	15500		0.004	11.160	0.293	60.157	60.450	0.33	**182.40**
	Antimony	0.53	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	1.6	BJ	Regression	0.036	0.001	0.006	0.007	0.02	0.33
	Barium	70.6		0.15	1.906	0.050	0.274	0.324	1.62	0.20
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.19	BJ	Regression	0.046	0.001	0.001	0.002	0.32	0.01
	Calcium	24500		3.5	15435.000	405.873	95.087	500.960	NA	NA
	Chromium	16.1		0.041	0.119	0.003	0.062	0.066	1.04	0.06
	Cobalt	14.8	J	0.02	0.053	0.001	0.057	0.059	1.59	0.04
	Copper	40.5	J	0.4	2.916	0.077	0.157	0.234	4.83	0.05
	Iron	26800		0.004	19.296	0.507	104.013	104.521	NA	NA
	Lead	5.9	J	0.3413	0.362	0.010	0.023	0.032	2.54	0.01
	Magnesium	7650		1	1377.000	36.209	29.690	65.899	NA	NA
	Manganese	594	J	0.25	26.730	0.703	2.305	3.008	27.93	0.11
	Mercury	0.13	U	0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	9.4	B	Regression	0.185	0.005	0.036	0.041	12.69	0.00
	Potassium	2230	J	1	401.400	10.555	8.655	19.210	NA	NA
	Selenium	0.68	B	Regression	0.195	0.005	0.003	0.008	0.06	0.12
	Silver	0.16	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	543	B	0.075	7.331	0.193	2.107	2.300	NA	NA
	Thallium	0.58	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.48
	Vanadium	69.2		0.0055	0.069	0.002	0.269	0.270	0.07	**4.06**
	Zinc	140	J	1.5	37.800	0.994	0.543	1.537	50.78	0.03
	Cyanide	1.3	U	1	0.117	0.003	0.003	0.006	20.49	0.00
RG-2D	Aluminum	17700		0.004	12.744	0.335	68.695	69.031	0.33	**208.29**
	Antimony	0.52	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.34	U	Regression	0.008	0.000	0.001	0.001	0.02	0.04
	Barium	89		0.15	2.403	0.063	0.345	0.409	1.62	0.25
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.3	B	Regression	0.067	0.002	0.001	0.003	0.32	0.01
	Calcium	28700		3.5	18081.000	475.452	111.387	586.839	NA	NA
	Chromium	19.4		0.041	0.143	0.004	0.075	0.079	1.04	0.08
	Cobalt	16.8	J	0.02	0.060	0.002	0.065	0.067	1.59	0.04
	Copper	54.4	J	0.4	3.917	0.103	0.211	0.314	4.83	0.07
	Iron	30900		0.004	22.248	0.585	119.926	120.511	NA	NA
	Lead	8.2	J	0.3413	0.504	0.013	0.032	0.045	2.54	0.02
	Magnesium	9070		1	1632.600	42.930	35.202	78.132	NA	NA
	Manganese	675	J	0.25	30.375	0.799	2.620	3.418	27.93	0.12
	Mercury	0.13	U	0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	13.8	J	Regression	0.247	0.006	0.054	0.060	12.69	0.00
	Potassium	3300	J	1	594.000	15.620	12.808	28.427	NA	NA
	Selenium	0.65	U	Regression	0.084	0.002	0.001	0.003	0.06	0.05
	Silver	0.16	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	697	B	0.075	9.410	0.247	2.705	2.953	NA	NA
	Thallium	0.57	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.47
	Vanadium	81		0.0055	0.080	0.002	0.314	0.316	0.07	4.75
	Zinc	263	J	1.5	71.010	1.867	1.021	2.888	50.78	0.06
	Cyanide	1.3	U	1	0.117	0.003	0.003	0.006	20.49	0.00
RG-3	Aluminum	14900		0.004	10.728	0.282	57.828	58.110	0.33	**175.34**
	Antimony	0.53	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.86	BJ	Regression	0.024	0.001	0.003	0.004	0.02	0.18
	Barium	53.8		0.15	1.453	0.038	0.209	0.247	1.62	0.15
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.31	B	Regression	0.069	0.002	0.001	0.003	0.32	0.01

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Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-3	Calcium	39300		3.5	24759.000	651.054	152.527	803.581	NA	NA
	Chromium	14.8		0.041	0.109	0.003	0.057	0.060	1.04	0.06
	Cobalt	13.8	J	0.02	0.050	0.001	0.054	0.055	1.59	0.03
	Copper	38.8	J	0.4	2.794	0.073	0.151	0.224	4.83	0.05
	Iron	27300		0.004	19.656	0.517	105.954	106.471	NA	NA
	Lead	4.1	J	0.3413	0.252	0.007	0.016	0.023	2.54	0.01
	Magnesium	8600		1	1548.000	40.706	33.377	74.083	NA	NA
	Manganese	792	J	0.25	35.640	0.937	3.074	4.011	27.93	0.14
	Mercury	0.13	U	0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	10.3	B	Regression	0.198	0.005	0.040	0.045	12.69	0.00
	Potassium	1500	J	1	270.000	7.100	5.822	12.921	NA	NA
	Selenium	0.66	U	Regression	0.086	0.002	0.001	0.004	0.06	0.06
	Silver	0.16	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	525	B	0.075	7.088	0.186	2.038	2.224	NA	NA
	Thallium	0.58	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.48
	Vanadium	59.6		0.0055	0.059	0.002	0.231	0.233	0.07	3.49
	Zinc	54.4	J	1.5	14.688	0.386	0.211	0.597	50.78	0.01
	Cyanide	1.3	U	1	0.117	0.003	0.003	0.006	20.49	0.00
RG-4	Aluminum	14400		0.004	10.368	0.273	55.888	56.160	0.33	169.45
	Antimony	0.49	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	1.2	BJ	Regression	0.030	0.001	0.005	0.005	0.02	0.25
	Barium	58.4		0.15	1.577	0.041	0.227	0.268	1.62	0.17
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.21	B	Regression	0.050	0.001	0.001	0.002	0.32	0.01
	Calcium	51000		3.5	32130.000	844.879	197.936	1042.815	NA	NA
	Chromium	12		0.041	0.089	0.002	0.047	0.049	1.04	0.05
	Cobalt	12.8	J	0.02	0.046	0.001	0.050	0.051	1.59	0.03
	Copper	33	J	0.4	2.376	0.062	0.128	0.191	4.83	0.04
	Iron	22700		0.004	16.344	0.430	88.101	88.531	NA	NA
	Lead	14.1	J	0.3413	0.866	0.023	0.055	0.078	2.54	0.03
	Magnesium	6920		1	1245.600	32.754	26.857	59.611	NA	NA
	Manganese	726	J	0.25	32.670	0.859	2.818	3.677	27.93	0.13
	Mercury	0.33		0.143	0.008	0.000	0.001	0.002	0.41	0.00
	Nickel	9.8	J	Regression	0.191	0.005	0.038	0.043	12.69	0.00
	Potassium	1310	J	1	235.800	6.201	5.084	11.285	NA	NA
	Selenium	0.61	U	Regression	0.078	0.002	0.001	0.003	0.06	0.05
	Silver	0.15	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	639	B	0.075	8.627	0.227	2.480	2.707	NA	NA
	Thallium	0.54	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.45
	Vanadium	49.2		0.0055	0.049	0.001	0.191	0.192	0.07	2.88
	Zinc	50.8	J	1.5	13.716	0.361	0.197	0.558	50.78	0.01
	Cyanide	1.2	U	1	0.108	0.003	0.002	0.005	20.49	0.00
RG-4D	Aluminum	9210		0.004	6.631	0.174	35.745	35.919	0.33	108.38
	Antimony	0.53	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.34	U	Regression	0.008	0.000	0.001	0.001	0.02	0.04
	Barium	36.3	B	0.15	0.980	0.026	0.141	0.167	1.62	0.10
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.11	B	Regression	0.029	0.001	0.000	0.001	0.32	0.00
	Calcium	30700		3.5	19341.000	508.584	119.150	627.734	NA	NA
	Chromium	8		0.041	0.059	0.002	0.031	0.033	1.04	0.03
	Cobalt	8	BJ	0.02	0.029	0.001	0.031	0.032	1.59	0.02

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Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-4D	Copper	19.6	J	0.4	1.411	0.037	0.076	0.113	4.83	0.02
	Iron	14500		0.004	10.440	0.275	56.276	56.550	NA	NA
	Lead	3.1	J	0.3413	0.190	0.005	0.012	0.017	2.54	0.01
	Magnesium	4700		1	846.000	22.246	18.241	40.487	NA	NA
	Manganese	445	J	0.25	20.025	0.527	1.727	2.254	27.93	0.08
	Mercury	0.19	J	0.143	0.005	0.000	0.001	0.001	0.41	0.00
	Nickel	6.1	B	Regression	0.133	0.004	0.024	0.027	12.69	0.00
	Potassium	754	B	1	135.720	3.569	2.926	6.495	NA	NA
	Selenium	1	B	Regression	0.302	0.008	0.004	0.012	0.06	0.19
	Silver	0.16	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	509	B	0.075	6.872	0.181	1.975	2.156	NA	NA
	Thallium	0.58	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.48
	Vanadium	32.7		0.0055	0.032	0.001	0.127	0.128	0.07	**1.92**
	Zinc	42.6	J	1.5	11.502	0.302	0.165	0.468	50.78	0.01
	Cyanide	1.3	U	1	0.117	0.003	0.003	0.006	20.49	0.00
RG-5	Aluminum	11200		0.004	8.064	0.212	43.468	43.680	0.33	**131.80**
	Antimony	0.47	U	0.04	0.002	0.000	0.001	0.001	0.02	0.04
	Arsenic	0.91	BJ	Regression	0.025	0.001	0.004	0.004	0.02	0.19
	Barium	43.5	B	0.15	1.175	0.031	0.169	0.200	1.62	0.12
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.15	B	Regression	0.037	0.001	0.001	0.002	0.32	0.00
	Calcium	81100		3.5	51093.000	1343.524	314.757	1658.281	NA	NA
	Chromium	14.6		0.041	0.108	0.003	0.057	0.059	1.04	0.06
	Cobalt	10.3	BJ	0.02	0.037	0.001	0.040	0.041	1.59	0.03
	Copper	32.9	J	0.4	2.369	0.062	0.128	0.190	4.83	0.04
	Iron	22300		0.004	16.056	0.422	86.548	86.971	NA	NA
	Lead	26.1	J	0.3413	1.603	0.042	0.101	0.143	2.54	0.06
	Magnesium	7630		1	1373.400	36.114	29.613	65.727	NA	NA
	Manganese	598	J	0.25	26.910	0.708	2.321	3.029	27.93	0.11
	Mercury	0.13	J	0.143	0.003	0.000	0.001	0.001	0.41	0.00
	Nickel	9.6	J	Regression	0.188	0.005	0.037	0.042	12.69	0.00
	Potassium	1290	J	1	232.200	6.106	5.007	11.112	NA	NA
	Selenium	0.98	B	Regression	0.295	0.008	0.004	0.012	0.06	0.18
	Silver	0.14	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	580	B	0.075	7.830	0.206	2.251	2.457	NA	NA
	Thallium	0.52	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.43
	Vanadium	48.1		0.0055	0.048	0.001	0.187	0.188	0.07	**2.82**
	Zinc	67.8	J	1.5	18.306	0.481	0.263	0.745	50.78	0.01
	Cyanide	1.2	U	1	0.108	0.003	0.002	0.005	20.49	0.00
RG-6	Aluminum	10500		0.004	7.560	0.199	40.752	40.950	0.33	**123.56**
	Antimony	0.46	U	0.04	0.002	0.000	0.001	0.001	0.02	0.04
	Arsenic	0.36	BJ	Regression	0.013	0.000	0.001	0.002	0.02	0.08
	Barium	43.5	B	0.15	1.175	0.031	0.169	0.200	1.62	0.12
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.13	B	Regression	0.033	0.001	0.001	0.001	0.32	0.00
	Calcium	57000		3.5	35910.000	944.277	221.222	1165.499	NA	NA
	Chromium	14.4		0.041	0.106	0.003	0.056	0.059	1.04	0.06
	Cobalt	9.5	BJ	0.02	0.034	0.001	0.037	0.038	1.59	0.02
	Copper	29.6	J	0.4	2.131	0.056	0.115	0.171	4.83	0.04
	Iron	19800		0.004	14.256	0.375	76.846	77.221	NA	NA
	Lead	11.4	J	0.3413	0.700	0.018	0.044	0.063	2.54	0.02

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Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d) Food	Soil	Total	NOAEL Benchmark	NOAEL HQ
RG-6	Magnesium	6700		1	1206.000	31.713	26.003	57.716	NA	NA
	Manganese	513	J	0.25	23.085	0.607	1.991	2.598	27.93	0.09
	Mercury	0.22	J	0.143	0.006	0.000	0.001	0.001	0.41	0.00
	Nickel	10.6	J	Regression	0.202	0.005	0.041	0.046	12.69	0.00
	Potassium	1250	J	1	225.000	5.917	4.851	10.768	NA	NA
	Selenium	0.57	U	Regression	0.073	0.002	0.001	0.003	0.06	0.05
	Silver	0.14	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	474	B	0.075	6.399	0.168	1.840	2.008	NA	NA
	Thallium	0.51	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.42
	Vanadium	51.4		0.0055	0.051	0.001	0.199	0.201	0.07	**3.01**
	Zinc	45.9	J	1.5	12.393	0.326	0.178	0.504	50.78	0.01
	Cyanide	1.1	U	1	0.099	0.003	0.002	0.005	20.49	0.00
RG-7	Aluminum	11500		0.004	8.280	0.218	44.633	44.850	0.33	**135.33**
	Antimony	0.53	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.92	BJ	Regression	0.025	0.001	0.004	0.004	0.02	0.20
	Barium	68		0.15	1.836	0.048	0.264	0.312	1.62	0.19
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.19	B	Regression	0.046	0.001	0.001	0.002	0.32	0.01
	Calcium	42900		3.5	27027.000	710.693	166.499	877.192	NA	NA
	Chromium	13.6		0.041	0.100	0.003	0.053	0.055	1.04	0.05
	Cobalt	11	BJ	0.02	0.040	0.001	0.043	0.044	1.59	0.03
	Copper	34.1	J	0.4	2.455	0.065	0.132	0.197	4.83	0.04
	Iron	21100		0.004	15.192	0.399	81.891	82.291	NA	NA
	Lead	5.9	J	0.3413	0.362	0.010	0.023	0.032	2.54	0.01
	Magnesium	6040		1	1087.200	28.589	23.442	52.030	NA	NA
	Manganese	531	J	0.25	23.895	0.628	2.061	2.689	27.93	0.10
	Mercury	0.11	U	0.143	0.001	0.000	0.000	0.000	0.41	0.00
	Nickel	8.2	B	Regression	0.167	0.004	0.032	0.036	12.69	0.00
	Potassium	1750	J	1	315.000	8.283	6.792	15.075	NA	NA
	Selenium	0.66	U	Regression	0.086	0.002	0.001	0.004	0.06	0.06
	Silver	0.16	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	479	B	0.075	6.467	0.170	1.859	2.029	NA	NA
	Thallium	0.58	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.48
	Vanadium	63.8		0.0055	0.063	0.002	0.248	0.249	0.07	**3.74**
	Zinc	43.4	J	1.5	11.718	0.308	0.168	0.477	50.78	0.01
	Cyanide	1.3	U	1	0.117	0.003	0.003	0.006	20.49	0.00
RG-8	Aluminum	10200		0.004	7.344	0.193	39.587	39.780	0.33	**120.03**
	Antimony	0.48	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.31	U	Regression	0.008	0.000	0.001	0.001	0.02	0.04
	Barium	53		0.15	1.431	0.038	0.206	0.243	1.62	0.15
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.03	B	Regression	0.010	0.000	0.000	0.000	0.32	0.00
	Calcium	48700		3.5	30681.000	806.777	189.009	995.786	NA	NA
	Chromium	10.8		0.041	0.080	0.002	0.042	0.044	1.04	0.04
	Cobalt	8.1	BJ	0.02	0.029	0.001	0.031	0.032	1.59	0.02
	Copper	25.1	J	0.4	1.807	0.048	0.097	0.145	4.83	0.03
	Iron	15800		0.004	11.376	0.299	61.321	61.620	NA	NA
	Lead	4.5	J	0.3413	0.276	0.007	0.017	0.025	2.54	0.01
	Magnesium	5320		1	957.600	25.181	20.647	45.828	NA	NA
	Manganese	408	J	0.25	18.360	0.483	1.583	2.066	27.93	0.07
	Mercury	0.19	J	0.143	0.005	0.000	0.001	0.001	0.41	0.00

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Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d) Food	Soil	Total	NOAEL Benchmark	NOAEL HQ
RG-8	Nickel	6.5	B	Regression	0.140	0.004	0.025	0.029	12.69	0.00
	Potassium	1910	J	1	343.800	9.040	7.413	16.453	NA	NA
	Selenium	0.6	U	Regression	0.077	0.002	0.001	0.003	0.06	0.05
	Silver	0.14	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	522	B	0.075	7.047	0.185	2.026	2.211	NA	NA
	Thallium	0.52	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.43
	Vanadium	44.8		0.0055	0.044	0.001	0.174	0.175	0.07	**2.63**
	Zinc	34.9	J	1.5	9.423	0.248	0.135	0.383	50.78	0.01
	Cyanide	1.2	U	1	0.108	0.003	0.002	0.005	20.49	0.00
RG-9	Aluminum	15400		0.004	11.088	0.292	59.769	60.060	0.33	**181.22**
	Antimony	0.56	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	1.1	BJ	Regression	0.028	0.001	0.004	0.005	0.02	0.23
	Barium	98.5		0.15	2.660	0.070	0.382	0.452	1.62	0.28
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.32	B	Regression	0.071	0.002	0.001	0.003	0.32	0.01
	Calcium	56200		3.5	35406.000	931.024	218.118	1149.141	NA	NA
	Chromium	20.2		0.041	0.149	0.004	0.078	0.082	1.04	0.08
	Cobalt	14.4	J	0.02	0.052	0.001	0.056	0.057	1.59	0.04
	Copper	47.2	J	0.4	3.398	0.089	0.183	0.273	4.83	0.06
	Iron	27500		0.004	19.800	0.521	106.730	107.251	NA	NA
	Lead	6.3	J	0.3413	0.387	0.010	0.024	0.035	2.54	0.01
	Magnesium	8270		1	1488.600	39.144	32.097	71.240	NA	NA
	Manganese	708	J	0.25	31.860	0.838	2.748	3.586	27.93	0.13
	Mercury	0.34	J	0.143	0.009	0.000	0.001	0.002	0.41	0.00
	Nickel	12.4	J	Regression	0.228	0.006	0.048	0.054	12.69	0.00
	Potassium	3540	J	1	637.200	16.756	13.739	30.495	NA	NA
	Selenium	0.69	U	Regression	0.090	0.002	0.001	0.004	0.06	0.06
	Silver	0.17	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	668	B	0.075	9.018	0.237	2.593	2.830	NA	NA
	Thallium	0.61	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.51
	Vanadium	85.9		0.0055	0.085	0.002	0.333	0.336	0.07	**5.04**
	Zinc	155	J	1.5	41.850	1.100	0.602	1.702	50.78	0.03
	Cyanide	1.4	U	1	0.126	0.003	0.003	0.006	20.49	0.00
RG-10	Aluminum	9500		0.004	6.840	0.180	36.870	37.050	0.33	**111.79**
	Antimony	0.52	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	1	BJ	Regression	0.027	0.001	0.004	0.005	0.02	0.21
	Barium	52.6		0.15	1.420	0.037	0.204	0.241	1.62	0.15
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.11	B	Regression	0.029	0.001	0.000	0.001	0.32	0.00
	Calcium	56700		3.5	35721.000	939.307	220.058	1159.365	NA	NA
	Chromium	13.9		0.041	0.103	0.003	0.054	0.057	1.04	0.05
	Cobalt	7.4	BJ	0.02	0.027	0.001	0.029	0.029	1.59	0.02
	Copper	23.7	J	0.4	1.706	0.045	0.092	0.137	4.83	0.03
	Iron	16000		0.004	11.520	0.303	62.098	62.400	NA	NA
	Lead	8.2	J	0.3413	0.504	0.013	0.032	0.045	2.54	0.02
	Magnesium	4610		1	829.800	21.820	17.892	39.712	NA	NA
	Manganese	431	J	0.25	19.395	0.510	1.673	2.183	27.93	0.08
	Mercury	0.25	J	0.143	0.006	0.000	0.001	0.001	0.41	0.00
	Nickel	7.6	B	Regression	0.157	0.004	0.029	0.034	12.69	0.00
	Potassium	1650	J	1	297.000	7.810	6.404	14.214	NA	NA
	Selenium	1.1	B	Regression	0.337	0.009	0.004	0.013	0.06	0.21

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Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d) Food	Soil	Total	NOAEL Benchmark	NOAEL HQ
RG-10	Silver	0.16	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	599	B	0.075	8.087	0.213	2.325	2.537	NA	NA
	Thallium	0.57	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.47
	Vanadium	46.3		0.0055	0.046	0.001	0.180	0.181	0.07	2.71
	Zinc	44	J	1.5	11.880	0.312	0.171	0.483	50.78	0.01
	Cyanide	1.3	U	1	0.117	0.003	0.003	0.006	20.49	0.00
RG-11	Aluminum	7680		0.004	5.530	0.145	29.807	29.952	0.33	90.37
	Antimony	0.49	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.38	BJ	Regression	0.014	0.000	0.001	0.002	0.02	0.08
	Barium	50.6		0.15	1.366	0.036	0.196	0.232	1.62	0.14
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.05	B	Regression	0.015	0.000	0.000	0.001	0.32	0.00
	Calcium	32000		3.5	20160.000	530.120	124.195	654.315	NA	NA
	Chromium	10.1		0.041	0.075	0.002	0.039	0.041	1.04	0.04
	Cobalt	6.7	BJ	0.02	0.024	0.001	0.026	0.027	1.59	0.02
	Copper	22	J	0.4	1.584	0.042	0.085	0.127	4.83	0.03
	Iron	12700		0.004	9.144	0.240	49.290	49.530	NA	NA
	Lead	3.4	J	0.3413	0.209	0.005	0.013	0.019	2.54	0.01
	Magnesium	3590		1	646.200	16.992	13.933	30.925	NA	NA
	Manganese	297	J	0.25	13.365	0.351	1.153	1.504	27.93	0.05
	Mercury	0.39	J	0.143	0.010	0.000	0.002	0.002	0.41	0.00
	Nickel	5.6	B	Regression	0.125	0.003	0.022	0.025	12.69	0.00
	Potassium	1410	J	1	253.800	6.674	5.472	12.146	NA	NA
	Selenium	0.62	U	Regression	0.080	0.002	0.001	0.003	0.06	0.05
	Silver	0.15	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	329	B	0.075	4.442	0.117	1.277	1.394	NA	NA
	Thallium	0.54	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.45
	Vanadium	44.5		0.0055	0.044	0.001	0.173	0.174	0.07	2.61
	Zinc	26.4	J	1.5	7.128	0.187	0.102	0.290	50.78	0.01
	Cyanide	1.2	U	1	0.108	0.003	0.002	0.005	20.49	0.00
RG-12	Aluminum	6210		0.004	4.471	0.118	24.102	24.219	0.33	73.08
	Antimony	0.49	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.48	BJ	Regression	0.016	0.000	0.002	0.002	0.02	0.11
	Barium	47	B	0.15	1.269	0.033	0.182	0.216	1.62	0.13
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.12	B	Regression	0.031	0.001	0.000	0.001	0.32	0.00
	Calcium	23900		3.5	15057.000	395.934	92.758	488.692	NA	NA
	Chromium	9.9		0.041	0.073	0.002	0.038	0.040	1.04	0.04
	Cobalt	6.1	BJ	0.02	0.022	0.001	0.024	0.024	1.59	0.02
	Copper	18.1	J	0.4	1.303	0.034	0.070	0.105	4.83	0.02
	Iron	12500		0.004	9.000	0.237	48.514	48.750	NA	NA
	Lead	4.7	J	0.3413	0.289	0.008	0.018	0.026	2.54	0.01
	Magnesium	2560		1	460.800	12.117	9.936	22.053	NA	NA
	Manganese	313	J	0.25	14.085	0.370	1.215	1.585	27.93	0.06
	Mercury	0.11	U	0.143	0.001	0.000	0.000	0.000	0.41	0.00
	Nickel	4.2	B	Regression	0.101	0.003	0.016	0.019	12.69	0.00
	Potassium	1010	B	1	181.800	4.781	3.920	8.700	NA	NA
	Selenium	0.61	U	Regression	0.078	0.002	0.001	0.003	0.06	0.05
	Silver	0.15	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	293	B	0.075	3.956	0.104	1.137	1.241	NA	NA
	Thallium	0.54	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.45

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Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d) Food	Soil	Total	NOAEL Benchmark	NOAEL HQ
RG-12	Vanadium	53		0.0055	0.052	0.001	0.206	0.207	0.07	**3.11**
	Zinc	39.1	J	1.5	10.557	0.278	0.152	0.429	50.78	0.01
	Cyanide	1.2	U	1	0.108	0.003	0.002	0.005	20.49	0.00
RG-13	Aluminum	14400		0.004	10.368	0.273	55.888	56.160	0.33	**169.45**
	Antimony	0.47	U	0.04	0.002	0.000	0.001	0.001	0.02	0.04
	Arsenic	1.1	BJ	Regression	0.028	0.001	0.004	0.005	0.02	0.23
	Barium	112		0.15	3.024	0.080	0.435	0.514	1.62	0.32
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.86	B	Regression	0.165	0.004	0.003	0.008	0.32	0.02
	Calcium	57400		3.5	36162.000	950.903	222.775	1173.678	NA	NA
	Chromium	21.6		0.041	0.159	0.004	0.084	0.088	1.04	0.08
	Cobalt	11.9	J	0.02	0.043	0.001	0.046	0.047	1.59	0.03
	Copper	43.8	J	0.4	3.154	0.083	0.170	0.253	4.83	0.05
	Iron	23100		0.004	16.632	0.437	89.653	90.091	NA	NA
	Lead	22.2	J	0.3413	1.364	0.036	0.086	0.122	2.54	0.05
	Magnesium	6600		1	1188.000	31.239	25.615	56.854	NA	NA
	Manganese	560	J	0.25	25.200	0.663	2.173	2.836	27.93	0.10
	Mercury	0.11	U	0.143	0.001	0.000	0.000	0.000	0.41	0.00
	Nickel	11.5	J	Regression	0.215	0.006	0.045	0.050	12.69	0.00
	Potassium	3020	J	1	543.600	14.294	11.721	26.015	NA	NA
	Selenium	1.6		Regression	0.515	0.014	0.006	0.020	0.06	0.31
	Silver	0.14	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	561	B	0.075	7.574	0.199	2.177	2.376	NA	NA
	Thallium	0.51	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.42
	Vanadium	70.2		0.0055	0.069	0.002	0.272	0.274	0.07	**4.12**
	Zinc	174	J	1.5	46.980	1.235	0.675	1.911	50.78	0.04
	Cyanide	1.2	U	1	0.108	0.003	0.002	0.005	20.49	0.00
RG-14	Aluminum	7220	J	0.004	5.198	0.137	28.022	28.158	0.33	**84.96**
	Antimony	0.83	U	0.04	0.003	0.000	0.002	0.002	0.02	0.08
	Arsenic	1.5	BJ	Regression	0.035	0.001	0.006	0.007	0.02	0.31
	Barium	36.5	BJ	0.15	0.986	0.026	0.142	0.168	1.62	0.10
	Beryllium	0.04	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.04	U	Regression	0.007	0.000	0.000	0.000	0.32	0.00
	Calcium	97500	J	3.5	61425.000	1615.210	378.407	1993.617	NA	NA
	Chromium	39	J	0.041	0.288	0.008	0.151	0.159	1.04	0.15
	Cobalt	4.9	BJ	0.02	0.018	0.000	0.019	0.019	1.59	0.01
	Copper	10.2	BJ	0.4	0.734	0.019	0.040	0.059	4.83	0.01
	Iron	9160	J	0.004	6.595	0.173	35.551	35.724	NA	NA
	Lead	3.4	J	0.3413	0.209	0.005	0.013	0.019	2.54	0.01
	Magnesium	3190	J	1	574.200	15.099	12.381	27.480	NA	NA
	Manganese	222	J	0.25	9.990	0.263	0.862	1.124	27.93	0.04
	Mercury	0.18	U	0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	17	J	Regression	0.289	0.008	0.066	0.074	12.69	0.01
	Potassium	706	BJ	1	127.080	3.342	2.740	6.082	NA	NA
	Selenium	1	U	Regression	0.137	0.004	0.002	0.006	0.06	0.09
	Silver	0.25	U	0.4	0.009	0.000	0.000	0.001	5.74	0.00
	Sodium	215	BJ	0.075	2.903	0.076	0.834	0.911	NA	NA
	Thallium	0.92	U	0.0055	0.000	0.000	0.002	0.002	0.002	0.77
	Vanadium	28.6	J	0.0055	0.028	0.001	0.111	0.112	0.07	**1.68**
	Zinc	21.8	J	1.5	5.886	0.155	0.085	0.239	50.78	0.00
	Cyanide	2	U	1	0.180	0.005	0.004	0.009	20.49	0.00

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Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-15	Aluminum	3500		0.004	2.520	0.066	13.584	13.650	0.33	**41.19**
	Antimony	0.46	U	0.04	0.002	0.000	0.001	0.001	0.02	0.04
	Arsenic	0.3	U	Regression	0.007	0.000	0.001	0.001	0.02	0.04
	Barium	23.1	B	0.15	0.624	0.016	0.090	0.106	1.62	0.07
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.02	U	Regression	0.004	0.000	0.000	0.000	0.32	0.00
	Calcium	800000		3.5	504000.000	13253.009	3104.877	16357.885	NA	NA
	Chromium	4.7		0.041	0.035	0.001	0.018	0.019	1.04	0.02
	Cobalt	2.2	BJ	0.02	0.008	0.000	0.009	0.009	1.59	0.01
	Copper	11.8	J	0.4	0.850	0.022	0.046	0.068	4.83	0.01
	Iron	4330		0.004	3.118	0.082	16.805	16.887	NA	NA
	Lead	1.6	J	0.3413	0.098	0.003	0.006	0.009	2.54	0.00
	Magnesium	1600		1	288.000	7.573	6.210	13.783	NA	NA
	Manganese	173	J	0.25	7.785	0.205	0.671	0.876	27.93	0.03
	Mercury	0.11	J	0.143	0.003	0.000	0.000	0.001	0.41	0.00
	Nickel	1.3	B	Regression	0.042	0.001	0.005	0.006	12.69	0.00
	Potassium	665	B	1	119.700	3.148	2.581	5.729	NA	NA
	Selenium	0.57	U	Regression	0.073	0.002	0.001	0.003	0.06	0.05
	Silver	0.14	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	255	B	0.075	3.443	0.091	0.990	1.080	NA	NA
	Thallium	0.51	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.42
	Vanadium	15		0.0055	0.015	0.000	0.058	0.059	0.07	0.88
	Zinc	13.6	J	1.5	3.672	0.097	0.053	0.149	50.78	0.00
	Cyanide	1.1	U	1	0.099	0.003	0.002	0.005	20.49	0.00
RG-16	Aluminum	5200		0.004	3.744	0.098	20.182	20.280	0.33	**61.19**
	Antimony	0.53	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.34	U	Regression	0.008	0.000	0.001	0.001	0.02	0.04
	Barium	21.6	B	0.15	0.583	0.015	0.084	0.099	1.62	0.06
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.08	B	Regression	0.022	0.001	0.000	0.001	0.32	0.00
	Calcium	46400		3.5	29232.000	768.675	180.083	948.757	NA	NA
	Chromium	5.9		0.041	0.044	0.001	0.023	0.024	1.04	0.02
	Cobalt	3.1	BJ	0.02	0.011	0.000	0.012	0.012	1.59	0.01
	Copper	19.9	J	0.4	1.433	0.038	0.077	0.115	4.83	0.02
	Iron	5780		0.004	4.162	0.109	22.433	22.542	NA	NA
	Lead	2.2	J	0.3413	0.135	0.004	0.009	0.012	2.54	0.00
	Magnesium	1660		1	298.800	7.857	6.443	14.300	NA	NA
	Manganese	196	J	0.25	8.820	0.232	0.761	0.993	27.93	0.04
	Mercury	0.12	U	0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	4.2	B	Regression	0.101	0.003	0.016	0.019	12.69	0.00
	Potassium	803	B	1	144.540	3.801	3.117	6.917	NA	NA
	Selenium	0.66	U	Regression	0.086	0.002	0.001	0.004	0.06	0.06
	Silver	0.16	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	492	B	0.075	6.642	0.175	1.909	2.084	NA	NA
	Thallium	0.58	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.48
	Vanadium	17		0.0055	0.017	0.000	0.066	0.066	0.07	**1.00**
	Zinc	25.9	J	1.5	6.993	0.184	0.101	0.284	50.78	0.01
	Cyanide	1.3	U	1	0.117	0.003	0.003	0.006	20.49	0.00
95% UCL on mean in River Gut	Aluminum	12778.90		0.004	9.201	0.242	49.596	49.838	0.33	**150.38**
	Antimony	0.28		0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.95		Regression	0.026	0.001	0.004	0.004	0.02	0.20

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Table C-4: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
95% UCL on mean in River Gut	Barium	68.16		0.15	1.840	0.048	0.265	0.313	1.62	0.19
	Beryllium	0.01		0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.28		Regression	0.064	0.002	0.001	0.003	0.32	0.01
	Calcium	*179734.49*		3.5	*113232.726*	*2977.528*	*697.567*	*3675.095*	NA	NA
	Chromium	18.37		0.041	0.136	0.004	0.071	0.075	1.04	0.07
	Cobalt	11.53		0.02	0.042	0.001	0.045	0.046	1.59	0.03
	Copper	35.64		0.4	2.566	0.067	0.138	0.206	4.83	0.04
	Iron	22110.85		0.004	15.920	0.419	85.814	86.233	NA	NA
	Lead	11.25		0.3413	0.691	0.018	0.044	0.062	2.54	0.02
	Magnesium	6717.89		1	1209.220	31.797	26.073	57.870	NA	NA
	Manganese	573.08		0.25	25.789	0.678	2.224	2.902	27.93	0.10
	Mercury	0.21		0.143	0.005	0.000	0.001	0.001	0.41	0.00
	Nickel	10.56		Regression	0.202	0.005	0.041	0.046	12.69	0.00
	Potassium	2079.02		1	374.224	9.840	8.069	17.909	NA	NA
	Selenium	0.73		Regression	0.212	0.006	0.003	0.008	0.06	0.13
	Silver	0.09		0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	560.48		0.075	7.566	0.199	2.175	2.374	NA	NA
	Thallium	0.31		0.0055	0.000	0.000	0.001	0.001	0.002	0.51
	Vanadium	60.16		0.0055	0.060	0.002	0.233	0.235	0.07	**3.53**
	Zinc	105.62		1.5	28.517	0.750	0.410	1.160	50.78	0.02
	Cyanide	0.69		1	0.124	0.003	0.003	0.006	20.49	0.00

Notes:

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Section 4.2)

[b] Soil to Plant Uptake Factors: Source is Baes et al., 1987; lead factor is mean UF (Sample et al., 1997).

Regression Models used for arsenic, cadmium, nickel, and selenium (Sample et al., 1997):
arsenic: ln(plant)=-1.915+0.673(ln[soil]); cadmium: ln(plant)=0.04+0.849(ln[soil]); nickel: ln(plant)=-1.663+0.754(ln[soil]
selenium: ln(plant)=0.518+1.136(ln[soil])

Plants were assumed to contain 82% moisture content (Salisbury and Ross, 1992).

U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit was used for exposure calculations.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated due to lack of benchmark.

NA: No benchmark available

Average soil moisture (18%) measured in the River Gut was used to calculate wet weight soil concentration for exposure from ingestion of soil.

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Table C-5: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
BG-1	Aluminum	15400		0.004	11.088	0.292	58.311	58.603	0.33	**176.82**
	Antimony	0.61	U	0.04	0.002	0.000	0.001	0.001	0.02	0.06
	Arsenic	0.39	U	Regression	0.009	0.000	0.001	0.001	0.02	0.04
	Barium	101		0.15	2.727	0.072	0.382	0.454	1.62	0.28
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.16	B	Regression	0.040	0.001	0.001	0.002	0.32	0.01
	Calcium	39800		3.5	25074.000	659.337	150.700	810.037	NA	NA
	Chromium	19.7		0.041	0.145	0.004	0.075	0.078	1.04	0.08
	Cobalt	11.4	BJ	0.02	0.041	0.001	0.043	0.044	1.59	0.03
	Copper	49.3	J	0.4	3.550	0.093	0.187	0.280	4.83	0.06
	Iron	20400		0.004	14.688	0.386	77.243	77.630	NA	NA
	Lead	12.9	J	0.3413	0.792	0.021	0.049	0.070	2.54	0.03
	Magnesium	5380		1	968.400	25.465	20.371	45.836	NA	NA
	Manganese	534	J	0.25	24.030	0.632	2.022	2.654	27.93	0.10
	Mercury	0.14	U	0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	11.7	B	Regression	0.218	0.006	0.044	0.050	12.69	0.00
	Potassium	3310	J	1	595.800	15.667	12.533	28.200	NA	NA
	Selenium	0.76	U	Regression	0.101	0.003	0.001	0.004	0.06	0.06
	Silver	0.18	U	0.4	0.006	0.000	0.000	0.001	5.74	0.00
	Sodium	660	B	0.075	8.910	0.234	2.499	2.733	NA	NA
	Thallium	0.67	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.54
	Vanadium	68.2		0.0055	0.068	0.002	0.258	0.260	0.07	**3.90**
	Zinc	58.7	J	1.5	15.849	0.417	0.222	0.639	50.78	0.01
	Cyanide	1.5	U	1	0.135	0.004	0.003	0.006	20.49	0.00
BG-2	Aluminum	3990		0.004	2.873	0.076	15.108	15.183	0.33	**45.81**
	Antimony	0.43	U	0.04	0.002	0.000	0.001	0.001	0.02	0.04
	Arsenic	0.43	BJ	Regression	0.015	0.000	0.002	0.002	0.02	0.09
	Barium	63		0.15	1.701	0.045	0.239	0.283	1.62	0.18
	Beryllium	0.02	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.02	U	Regression	0.004	0.000	0.000	0.000	0.32	0.00
	Calcium	19800		3.5	12474.000	328.012	74.971	402.983	NA	NA

Table C-5: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
BG-2	Chromium	4.6		0.041	0.034	0.001	0.017	0.018	1.04	0.02
	Cobalt	5.4	BJ	0.02	0.019	0.001	0.020	0.021	1.59	0.01
	Copper	11.2	J	0.4	0.806	0.021	0.042	0.064	4.83	0.01
	Iron	5300		0.004	3.816	0.100	20.068	20.168	NA	NA
	Lead	2.4	J	0.3413	0.147	0.004	0.009	0.013	2.54	0.01
	Magnesium	1150		1	207.000	5.443	4.354	9.798	NA	NA
	Manganese	339	J	0.25	15.255	0.401	1.284	1.685	27.93	0.06
	Mercury	0.1	U	0.143	0.001	0.000	0.000	0.000	0.41	0.00
	Nickel	3.2	B	Regression	0.082	0.002	0.012	0.014	12.69	0.00
	Potassium	582	B	1	104.760	2.755	2.204	4.958	NA	NA
	Selenium	0.53	U	Regression	0.067	0.002	0.001	0.003	0.06	0.04
	Silver	0.13	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	423	B	0.075	5.711	0.150	1.602	1.752	NA	NA
	Thallium	0.47	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.38
	Vanadium	29.9		0.0055	0.030	0.001	0.113	0.114	0.07	**1.71**
	Zinc	13.1	J	1.5	3.537	0.093	0.050	0.143	50.78	0.00
	Cyanide	1.1	U	1	0.099	0.003	0.002	0.005	20.49	0.00
Average in Bethlehem Gut	Aluminum	9695		0.004	6.980	0.184	36.709	36.893	0.33	**111.32**
	Antimony	0.26		0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	0.3125		Regression	0.012	0.000	0.001	0.002	0.02	0.07
	Barium	82		0.15	2.214	0.058	0.310	0.369	1.62	0.23
	Beryllium	0.0125		0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.085		Regression	0.023	0.001	0.000	0.001	0.32	0.00
	Calcium	29800		3.5	18774.000	493.675	112.836	606.510	NA	NA
	Chromium	12.15		0.041	0.090	0.002	0.046	0.048	1.04	0.05
	Cobalt	8.4		0.02	0.030	0.001	0.032	0.033	1.59	0.02
	Copper	30.25		0.4	2.178	0.057	0.115	0.172	4.83	0.04
	Iron	12850		0.004	9.252	0.243	48.656	48.899	NA	NA
	Lead	7.65		0.3413	0.470	0.012	0.029	0.041	2.54	0.02
	Magnesium	3265		1	587.700	15.454	12.363	27.817	NA	NA
	Manganese	436.5		0.25	19.643	0.517	1.653	2.169	27.93	0.08

Table C-5: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
Average in Bethlehem Gut	Mercury	0.06		0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	7.45		Regression	0.155	0.004	0.028	0.032	12.69	0.00
	Potassium	1946		1	350.280	9.211	7.368	16.579	NA	NA
	Selenium	0.3225		Regression	0.084	0.002	0.001	0.003	0.06	0.05
	Silver	0.0775		0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	541.5		0.075	7.310	0.192	2.050	2.243	NA	NA
	Thallium	0.285		0.0055	0.000	0.000	0.001	0.001	0.002	0.46
	Vanadium	49.05		0.0055	0.049	0.001	0.186	0.187	0.07	**2.81**
	Zinc	35.9		1.5	9.693	0.255	0.136	0.391	50.78	0.01
	Cyanide	0.65		1	0.117	0.003	0.002	0.006	20.49	0.00

Notes:

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Section 4.2)

* Soil to Plant Uptake Factors: Source is Baes et al., 1987; lead factor is mean UF (Sample et al., 1997).

Regression Models used for arsenic, cadmium, nickel, and selenium (Sample et al., 1997):

arsenic: ln(plant)=-1.915+0.673(ln[soil]); cadmium: ln(plant)=0.04+0.849(ln[soil]); nickel: ln(plant)=-1.663+0.754(ln[soil]

selenium: ln(plant)=0.518+1.136(ln[soil])

Plants were assumed to contain 82% moisture content (Salisbury and Ross, 1992).

U = Analyte was not detected above the referenced reporting limit; 1/2 the detection limit was used for the exposure calculations.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated due to lack of benchmark.

NA: No benchmark available

Average soil moisture (20%) measured in the Bethlehem Gut was used to calculate wet weight soil concentration for exposure from ingestion of soil.

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Table C-6: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
FPG-1	Aluminum	10200		0.004	7.344	0.193	36.208	36.401	0.33	**109.83**
	Antimony	0.52	U	0.04	0.002	0.000	0.001	0.001	0.02	0.05
	Arsenic	1.4	BJ	Regression	0.033	0.001	0.005	0.006	0.02	0.27
	Barium	67.4		0.15	1.820	0.048	0.239	0.287	1.62	0.18
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.09	B	Regression	0.024	0.001	0.000	0.001	0.32	0.00
	Calcium	36600		3.5	23058.000	606.325	129.922	736.247	NA	NA
	Chromium	13.9		0.041	0.103	0.003	0.049	0.052	1.04	0.05
	Cobalt	8.2	BJ	0.02	0.030	0.001	0.029	0.030	1.59	0.02
	Copper	33.1	J	0.4	2.383	0.063	0.117	0.180	4.83	0.04
	Iron	14300		0.004	10.296	0.271	50.762	51.033	NA	NA
	Lead	8.8	J	0.3413	0.541	0.014	0.031	0.045	2.54	0.02
	Magnesium	3680		1	662.400	17.418	13.063	30.481	NA	NA
	Manganese	267	J	0.25	12.015	0.316	0.948	1.264	27.93	0.05
	Mercury	0.13	U	0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	7.7	B	Regression	0.159	0.004	0.027	0.032	12.69	0.00
	Potassium	2150	J	1	387.000	10.176	7.632	17.808	NA	NA
	Selenium	1.1	B	Regression	0.337	0.009	0.004	0.013	0.06	0.20
	Silver	0.16	U	0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	570	B	0.075	7.695	0.202	2.023	2.226	NA	NA
	Thallium	0.57	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.43
	Vanadium	54.6		0.0055	0.054	0.001	0.194	0.195	0.07	**2.93**
	Zinc	39.4	J	1.5	10.638	0.280	0.140	0.420	50.78	0.01
	Cyanide	1.3	U	1	0.117	0.003	0.002	0.005	20.49	0.00
FPG-2	Aluminum	9750		0.004	7.020	0.185	34.610	34.795	0.33	**104.99**
	Antimony	0.51	U	0.04	0.002	0.000	0.001	0.001	0.02	0.04
	Arsenic	2.8	J	Regression	0.053	0.001	0.010	0.011	0.02	0.52
	Barium	70		0.15	1.890	0.050	0.248	0.298	1.62	0.18
	Beryllium	0.03	U	0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.2	B	Regression	0.048	0.001	0.001	0.002	0.32	0.01
	Calcium	25300		3.5	15939.000	419.126	89.810	508.936	NA	NA

304205

Table C-6: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
FPG-2	Chromium	13.9		0.041	0.103	0.003	0.049	0.052	1.04	0.05
	Cobalt	8.6	BJ	0.02	0.031	0.001	0.031	0.031	1.59	0.02
	Copper	33.2	J	0.4	2.390	0.063	0.118	0.181	4.83	0.04
	Iron	14800		0.004	10.656	0.280	52.537	52.817	NA	NA
	Lead	5.7	J	0.3413	0.350	0.009	0.020	0.029	2.54	0.01
	Magnesium	3670		1	660.600	17.371	13.028	30.399	NA	NA
	Manganese	332	J	0.25	14.940	0.393	1.179	1.571	27.93	0.06
	Mercury	0.12	U	0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	6.9	B	Regression	0.146	0.004	0.024	0.028	12.69	0.00
	Potassium	1940	J	1	349.200	9.182	6.887	16.069	NA	NA
	Selenium	0.63	U	Regression	0.081	0.002	0.001	0.003	0.06	0.05
	Silver	0.15	U	0.4	0.005	0.000	0.000	0.000	5.74	0.00
	Sodium	887	B	0.075	11.975	0.315	3.149	3.464	NA	NA
	Thallium	0.56	U	0.0055	0.000	0.000	0.001	0.001	0.002	0.43
	Vanadium	56.5		0.0055	0.056	0.001	0.201	0.202	0.07	**3.03**
	Zinc	34.2	J	1.5	9.234	0.243	0.121	0.364	50.78	0.01
	Cyanide	1.2	U	1	0.108	0.003	0.002	0.005	20.49	0.00
Average in Fairplain Gut	Aluminum	9975		0.004	7.182	0.189	35.409	35.598	0.33	**107.41**
	Antimony	0.2575		0.04	0.002	0.000	0.001	0.001	0.02	0.04
	Arsenic	2.1		Regression	0.044	0.001	0.007	0.009	0.02	0.40
	Barium	68.7		0.15	1.855	0.049	0.244	0.293	1.62	0.18
	Beryllium	0.015		0.01	0.000	0.000	0.000	0.000	0.21	0.00
	Cadmium	0.145		Regression	0.036	0.001	0.001	0.001	0.32	0.00
	Calcium	30950		3.5	19498.500	512.726	109.866	622.592	NA	NA
	Chromium	13.9		0.041	0.103	0.003	0.049	0.052	1.04	0.05
	Cobalt	8.4		0.02	0.030	0.001	0.030	0.031	1.59	0.02
	Copper	33.15		0.4	2.387	0.063	0.118	0.180	4.83	0.04
	Iron	14550		0.004	10.476	0.275	51.649	51.925	NA	NA
	Lead	7.25		0.3413	0.445	0.012	0.026	0.037	2.54	0.01
	Magnesium	3675		1	661.500	17.395	13.045	30.440	NA	NA
	Manganese	299.5		0.25	13.478	0.354	1.063	1.418	27.93	0.05

Table C-6: Estimated Chemical Exposure for the Goat Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Plant Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
Average in Fairplain Gut	Mercury	0.0625		0.143	0.002	0.000	0.000	0.000	0.41	0.00
	Nickel	7.3		Regression	0.153	0.004	0.026	0.030	12.69	0.00
	Potassium	2045		1	368.100	9.679	7.259	16.939	NA	NA
	Selenium	0.7075		Regression	0.204	0.005	0.003	0.008	0.06	0.12
	Silver	0.0775		0.4	0.006	0.000	0.000	0.000	5.74	0.00
	Sodium	728.5		0.075	9.835	0.259	2.586	2.845	NA	NA
	Thallium	0.2825		0.0055	0.000	0.000	0.001	0.001	0.002	0.43
	Vanadium	55.55		0.0055	0.055	0.001	0.197	0.199	0.07	**2.98**
	Zinc	36.8		1.5	9.936	0.261	0.131	0.392	50.78	0.01
	Cyanide	0.625		1	0.113	0.003	0.002	0.005	20.49	0.00

Notes:

[a] NOAELs: No Observed Adverse Effects Levels (Section 4.2)

* Soil to Plant Uptake Factors: Source is Baes et al., 1987; lead factor is mean UF (Sample et al., 1997); cyanide UF conservatively assumed to be 1.

Regression Models used for arsenic, cadmium, nickel, and selenium (Sample et al., 1997):

arsenic: ln(plant)=-1.915+0.673(ln[soil]); cadmium: ln(plant)=0.04+0.849(ln[soil]); nickel: ln(plant)=-1.663+0.754(ln[soil]

selenium: ln(plant)=0.518+1.136(ln[soil])

Plants were assumed to contain 82% moisture content (Salisbury and Ross, 1992).

U = Analyte was not detected above the referenced reporting limit; 1/2 the detection limit was used for the exposure calculations.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated due to lack of benchmark.

NA: No benchmark available

Average soil moisture (25%) measured in the Fair Plain Gut was used to calculate wet weight soil concentration for exposure from ingestion of soil.

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Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-2	Aluminum	15500		0.004	14.26	11.41	1.70	**6.72**
	Antimony	0.53	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	1.6	BJ	Regression	0.05	0.04	0.11	0.34
	Barium	70.6		0.15	2.44	1.95	8.30	0.23
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.19	BJ	Regression	0.06	0.05	1.63	0.03
	Calcium	24500		3.5	19722.50	15778.00	NA	NA
	Chromium	16.1		0.041	0.15	0.12	5.34	0.02
	Cobalt	14.8	J	0.02	0.07	0.05	8.13	0.01
	Copper	40.5	J	0.4	3.73	2.98	24.74	0.12
	Iron	26800		0.004	24.66	19.72	NA	NA
	Lead	5.9	J	0.3413	0.46	0.37	13.01	0.03
	Magnesium	7650		1	1759.50	1407.60	NA	NA
	Manganese	594	J	0.25	34.16	27.32	143.14	0.19
	Mercury	0.13	U	0.143	0.00	0.00	2.11	0.00
	Nickel	9.4	B	Regression	0.24	0.19	65.06	0.00
	Potassium	2230	J	1	512.90	410.32	NA	NA
	Selenium	0.68	B	Regression	0.25	0.20	0.33	0.61
	Silver	0.16	U	0.4	0.01	0.01	29.44	0.00
	Sodium	543	B	0.075	9.37	7.49	NA	NA
	Thallium	0.58	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	69.2		0.0055	0.09	0.07	0.34	0.21
	Zinc	140	J	1.5	48.30	38.64	260.25	0.15
	Cyanide	1.3	U	1	0.15	0.12	105.02	0.00
RG-2D	Aluminum	17700		0.004	16.28	13.03	1.70	**7.67**
	Antimony	0.52	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.34	U	Regression	0.01	0.01	0.11	0.07
	Barium	89		0.15	3.07	2.46	8.30	0.30
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.3	B	Regression	0.09	0.07	1.63	0.04
	Calcium	28700		3.5	23103.50	18482.80	NA	NA
	Chromium	19.4		0.041	0.18	0.15	5.34	0.03
	Cobalt	16.8	J	0.02	0.08	0.06	8.13	0.01
	Copper	54.4	J	0.4	5.00	4.00	24.74	0.16
	Iron	30900		0.004	28.43	22.74	NA	NA
	Lead	8.2	J	0.3413	0.64	0.51	13.01	0.04
	Magnesium	9070		1	2086.10	1668.88	NA	NA
	Manganese	675	J	0.25	38.81	31.05	143.14	0.22
	Mercury	0.13	U	0.143	0.00	0.00	2.11	0.00
	Nickel	13.8	J	Regression	0.32	0.25	65.06	0.00
	Potassium	3300	J	1	759.00	607.20	NA	NA
	Selenium	0.65	U	Regression	0.11	0.09	0.33	0.26
	Silver	0.16	U	0.4	0.01	0.01	29.44	0.00
	Sodium	697	B	0.075	12.02	9.62	NA	NA
	Thallium	0.57	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	81		0.0055	0.10	0.08	0.34	0.24

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Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-2D	Zinc	263	J	1.5	90.74	72.59	260.25	0.28
	Cyanide	1.3	U	1	0.15	0.12	105.02	0.00
RG-3	Aluminum	14900		0.004	13.71	10.97	1.70	**6.46**
	Antimony	0.53	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.86	BJ	Regression	0.03	0.02	0.11	0.22
	Barium	53.8		0.15	1.86	1.48	8.30	0.18
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.31	B	Regression	0.09	0.07	1.63	0.04
	Calcium	39300		3.5	31636.50	25309.20	NA	NA
	Chromium	14.8		0.041	0.14	0.11	5.34	0.02
	Cobalt	13.8	J	0.02	0.06	0.05	8.13	0.01
	Copper	38.8	J	0.4	3.57	2.86	24.74	0.12
	Iron	27300		0.004	25.12	20.09	NA	NA
	Lead	4.1	J	0.3413	0.32	0.26	13.01	0.02
	Magnesium	8600		1	1978.00	1582.40	NA	NA
	Manganese	792	J	0.25	45.54	36.43	143.14	0.25
	Mercury	0.13	U	0.143	0.00	0.00	2.11	0.00
	Nickel	10.3	B	Regression	0.25	0.20	65.06	0.00
	Potassium	1500	J	1	345.00	276.00	NA	NA
	Selenium	0.66	U	Regression	0.11	0.09	0.33	0.27
	Silver	0.16	U	0.4	0.01	0.01	29.44	0.00
	Sodium	525	B	0.075	9.06	7.25	NA	NA
	Thallium	0.58	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	59.6		0.0055	0.08	0.06	0.34	0.18
	Zinc	54.4	J	1.5	18.77	15.01	260.25	0.06
	Cyanide	1.3	U	1	0.15	0.12	105.02	0.00
RG-4	Aluminum	14400		0.004	13.25	10.60	1.70	**6.24**
	Antimony	0.49	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	1.2	BJ	Regression	0.04	0.03	0.11	0.28
	Barium	58.4		0.15	2.01	1.61	8.30	0.19
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.21	B	Regression	0.06	0.05	1.63	0.03
	Calcium	51000		3.5	41055.00	32844.00	NA	NA
	Chromium	12		0.041	0.11	0.09	5.34	0.02
	Cobalt	12.8	J	0.02	0.06	0.05	8.13	0.01
	Copper	33	J	0.4	3.04	2.43	24.74	0.10
	Iron	22700		0.004	20.88	16.71	NA	NA
	Lead	14.1	J	0.3413	1.11	0.89	13.01	0.07
	Magnesium	6920		1	1591.60	1273.28	NA	NA
	Manganese	726	J	0.25	41.75	33.40	143.14	0.23
	Mercury	0.33		0.143	0.01	0.01	2.11	0.00
	Nickel	9.8	J	Regression	0.24	0.19	65.06	0.00
	Potassium	1310	J	1	301.30	241.04	NA	NA
	Selenium	0.61	U	Regression	0.10	0.08	0.33	0.25
	Silver	0.15	U	0.4	0.01	0.01	29.44	0.00
	Sodium	639	B	0.075	11.02	8.82	NA	NA

304209

Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-4	Thallium	0.54	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	49.2		0.0055	0.06	0.05	0.34	0.15
	Zinc	50.8	J	1.5	17.53	14.02	260.25	0.05
	Cyanide	1.2	U	1	0.14	0.11	105.02	0.00
RG-4D	Aluminum	9210		0.004	8.47	6.78	1.70	**3.99**
	Antimony	0.53	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.34	U	Regression	0.01	0.01	0.11	0.07
	Barium	36.3	B	0.15	1.25	1.00	8.30	0.12
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.11	B	Regression	0.04	0.03	1.63	0.02
	Calcium	30700		3.5	24713.50	19770.80	NA	NA
	Chromium	8		0.041	0.08	0.06	5.34	0.01
	Cobalt	8	BJ	0.02	0.04	0.03	8.13	0.00
	Copper	19.6	J	0.4	1.80	1.44	24.74	0.06
	Iron	14500		0.004	13.34	10.67	NA	NA
	Lead	3.1	J	0.3413	0.24	0.19	13.01	0.01
	Magnesium	4700		1	1081.00	864.80	NA	NA
	Manganese	445	J	0.25	25.59	20.47	143.14	0.14
	Mercury	0.19	J	0.143	0.01	0.00	2.11	0.00
	Nickel	6.1	B	Regression	0.17	0.14	65.06	0.00
	Potassium	754	B	1	173.42	138.74	NA	NA
	Selenium	1	B	Regression	0.39	0.31	0.33	0.95
	Silver	0.16	U	0.4	0.01	0.01	29.44	0.00
	Sodium	509	B	0.075	8.78	7.02	NA	NA
	Thallium	0.58	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	32.7		0.0055	0.04	0.03	0.34	0.10
	Zinc	42.6	J	1.5	14.70	11.76	260.25	0.05
	Cyanide	1.3	U	1	0.15	0.12	105.02	0.00
RG-5	Aluminum	11200		0.004	10.30	8.24	1.70	**4.85**
	Antimony	0.47	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.91	BJ	Regression	0.03	0.03	0.11	0.23
	Barium	43.5	B	0.15	1.50	1.20	8.30	0.14
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.15	B	Regression	0.05	0.04	1.63	0.02
	Calcium	81100		3.5	65285.50	52228.40	NA	NA
	Chromium	14.6		0.041	0.14	0.11	5.34	0.02
	Cobalt	10.3	BJ	0.02	0.05	0.04	8.13	0.00
	Copper	32.9	J	0.4	3.03	2.42	24.74	0.10
	Iron	22300		0.004	20.52	16.41	NA	NA
	Lead	26.1	J	0.3413	2.05	1.64	13.01	0.13
	Magnesium	7630		1	1754.90	1403.92	NA	NA
	Manganese	598	J	0.25	34.39	27.51	143.14	0.19
	Mercury	0.13	J	0.143	0.00	0.00	2.11	0.00
	Nickel	9.6	J	Regression	0.24	0.19	65.06	0.00
	Potassium	1290	J	1	296.70	237.36	NA	NA
	Selenium	0.98	B	Regression	0.38	0.30	0.33	0.93

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Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-5	Silver	0.14	U	0.4	0.01	0.01	29.44	0.00
	Sodium	580	B	0.075	10.01	8.00	NA	NA
	Thallium	0.52	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	48.1		0.0055	0.06	0.05	0.34	0.14
	Zinc	67.8	J	1.5	23.39	18.71	260.25	0.07
	Cyanide	1.2	U	1	0.14	0.11	105.02	0.00
RG-6	Aluminum	10500		0.004	9.66	7.73	1.70	**4.55**
	Antimony	0.46	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.36	BJ	Regression	0.02	0.01	0.11	0.12
	Barium	43.5	B	0.15	1.50	1.20	8.30	0.14
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.13	B	Regression	0.04	0.03	1.63	0.02
	Calcium	57000		3.5	45885.00	36708.00	NA	NA
	Chromium	14.4		0.041	0.14	0.11	5.34	0.02
	Cobalt	9.5	BJ	0.02	0.04	0.03	8.13	0.00
	Copper	29.6	J	0.4	2.72	2.18	24.74	0.09
	Iron	19800		0.004	18.22	14.57	NA	NA
	Lead	11.4	J	0.3413	0.89	0.72	13.01	0.06
	Magnesium	6700		1	1541.00	1232.80	NA	NA
	Manganese	513	J	0.25	29.50	23.60	143.14	0.16
	Mercury	0.22	J	0.143	0.01	0.01	2.11	0.00
	Nickel	10.6	J	Regression	0.26	0.21	65.06	0.00
	Potassium	1250	J	1	287.50	230.00	NA	NA
	Selenium	0.57	U	Regression	0.09	0.07	0.33	0.23
	Silver	0.14	U	0.4	0.01	0.01	29.44	0.00
	Sodium	474	B	0.075	8.18	6.54	NA	NA
	Thallium	0.51	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	51.4		0.0055	0.07	0.05	0.34	0.15
	Zinc	45.9	J	1.5	15.84	12.67	260.25	0.05
	Cyanide	1.1	U	1	0.13	0.10	105.02	0.00
RG-7	Aluminum	11500		0.004	10.58	8.46	1.70	**4.98**
	Antimony	0.53	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.92	BJ	Regression	0.03	0.03	0.11	0.23
	Barium	68		0.15	2.35	1.88	8.30	0.23
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.19	B	Regression	0.06	0.05	1.63	0.03
	Calcium	42900		3.5	34534.50	27627.60	NA	NA
	Chromium	13.6		0.041	0.13	0.10	5.34	0.02
	Cobalt	11	BJ	0.02	0.05	0.04	8.13	0.00
	Copper	34.1	J	0.4	3.14	2.51	24.74	0.10
	Iron	21100		0.004	19.41	15.53	NA	NA
	Lead	5.9	J	0.3413	0.46	0.37	13.01	0.03
	Magnesium	6040		1	1389.20	1111.36	NA	NA
	Manganese	531	J	0.25	30.53	24.43	143.14	0.17
	Mercury	0.11	U	0.143	0.00	0.00	2.11	0.00
	Nickel	8.2	B	Regression	0.21	0.17	65.06	0.00

304211

Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-7	Potassium	1750	J	1	402.50	322.00	NA	NA
	Selenium	0.66	U	Regression	0.11	0.09	0.33	0.27
	Silver	0.16	U	0.4	0.01	0.01	29.44	0.00
	Sodium	479	B	0.075	8.26	6.61	NA	NA
	Thallium	0.58	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	63.8		0.0055	0.08	0.06	0.34	0.19
	Zinc	43.4	J	1.5	14.97	11.98	260.25	0.05
	Cyanide	1.3	U	1	0.15	0.12	105.02	0.00
RG-8	Aluminum	10200		0.004	9.38	7.51	1.70	**4.42**
	Antimony	0.48	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.31	U	Regression	0.01	0.01	0.11	0.07
	Barium	53		0.15	1.83	1.46	8.30	0.18
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.03	B	Regression	0.01	0.01	1.63	0.01
	Calcium	48700		3.5	39203.50	31362.80	NA	NA
	Chromium	10.8		0.041	0.10	0.08	5.34	0.02
	Cobalt	8.1	BJ	0.02	0.04	0.03	8.13	0.00
	Copper	25.1	J	0.4	2.31	1.85	24.74	0.07
	Iron	15800		0.004	14.54	11.63	NA	NA
	Lead	4.5	J	0.3413	0.35	0.28	13.01	0.02
	Magnesium	5320		1	1223.60	978.88	NA	NA
	Manganese	408	J	0.25	23.46	18.77	143.14	0.13
	Mercury	0.19	J	0.143	0.01	0.00	2.11	0.00
	Nickel	6.5	B	Regression	0.18	0.14	65.06	0.00
	Potassium	1910	J	1	439.30	351.44	NA	NA
	Selenium	0.6	U	Regression	0.10	0.08	0.33	0.24
	Silver	0.14	U	0.4	0.01	0.01	29.44	0.00
	Sodium	522	B	0.075	9.00	7.20	NA	NA
	Thallium	0.52	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	44.8		0.0055	0.06	0.05	0.34	0.13
	Zinc	34.9	J	1.5	12.04	9.63	260.25	0.04
	Cyanide	1.2	U	1	0.14	0.11	105.02	0.00
RG-9	Aluminum	15400		0.004	14.17	11.33	1.70	**6.67**
	Antimony	0.56	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	1.1	BJ	Regression	0.04	0.03	0.11	0.26
	Barium	98.5		0.15	3.40	2.72	8.30	0.33
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.32	B	Regression	0.09	0.07	1.63	0.04
	Calcium	56200		3.5	45241.00	36192.80	NA	NA
	Chromium	20.2		0.041	0.19	0.15	5.34	0.03
	Cobalt	14.4	J	0.02	0.07	0.05	8.13	0.01
	Copper	47.2	J	0.4	4.34	3.47	24.74	0.14
	Iron	27500		0.004	25.30	20.24	NA	NA
	Lead	6.3	J	0.3413	0.49	0.40	13.01	0.03
	Magnesium	8270		1	1902.10	1521.68	NA	NA
	Manganese	708	J	0.25	40.71	32.57	143.14	0.23

304212

Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-9	Mercury	0.34	J	0.143	0.01	0.01	2.11	0.00
	Nickel	12.4	J	Regression	0.29	0.23	65.06	0.00
	Potassium	3540	J	1	814.20	651.36	NA	NA
	Selenium	0.69	U	Regression	0.12	0.09	0.33	0.28
	Silver	0.17	U	0.4	0.01	0.01	29.44	0.00
	Sodium	668	B	0.075	11.52	9.22	NA	NA
	Thallium	0.61	U	0.0055	0.00	0.00	0.01	0.03
	Vanadium	85.9		0.0055	0.11	0.09	0.34	0.25
	Zinc	155	J	1.5	53.48	42.78	260.25	0.16
	Cyanide	1.4	U	1	0.16	0.13	105.02	0.00
RG-10	Aluminum	9500		0.004	8.74	6.99	1.70	**4.12**
	Antimony	0.52	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	1	BJ	Regression	0.03	0.03	0.11	0.24
	Barium	52.6		0.15	1.81	1.45	8.30	0.18
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.11	B	Regression	0.04	0.03	1.63	0.02
	Calcium	56700		3.5	45643.50	36514.80	NA	NA
	Chromium	13.9		0.041	0.13	0.10	5.34	0.02
	Cobalt	7.4	BJ	0.02	0.03	0.03	8.13	0.00
	Copper	23.7	J	0.4	2.18	1.74	24.74	0.07
	Iron	16000		0.004	14.72	11.78	NA	NA
	Lead	8.2	J	0.3413	0.64	0.51	13.01	0.04
	Magnesium	4610		1	1060.30	848.24	NA	NA
	Manganese	431	J	0.25	24.78	19.83	143.14	0.14
	Mercury	0.25	J	0.143	0.01	0.01	2.11	0.00
	Nickel	7.6	B	Regression	0.20	0.16	65.06	0.00
	Potassium	1650	J	1	379.50	303.60	NA	NA
	Selenium	1.1	B	Regression	0.43	0.34	0.33	**1.06**
	Silver	0.16	U	0.4	0.01	0.01	29.44	0.00
	Sodium	599	B	0.075	10.33	8.27	NA	NA
	Thallium	0.57	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	46.3		0.0055	0.06	0.05	0.34	0.14
	Zinc	44	J	1.5	15.18	12.14	260.25	0.05
	Cyanide	1.3	U	1	0.15	0.12	105.02	0.00
RG-11	Aluminum	7680		0.004	7.07	5.65	1.70	**3.33**
	Antimony	0.49	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.38	BJ	Regression	0.02	0.01	0.11	0.13
	Barium	50.6		0.15	1.75	1.40	8.30	0.17
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.05	B	Regression	0.02	0.02	1.63	0.01
	Calcium	32000		3.5	25760.00	20608.00	NA	NA
	Chromium	10.1		0.041	0.10	0.08	5.34	0.01
	Cobalt	6.7	BJ	0.02	0.03	0.02	8.13	0.00
	Copper	22	J	0.4	2.02	1.62	24.74	0.07
	Iron	12700		0.004	11.68	9.35	NA	NA
	Lead	3.4	J	0.3413	0.27	0.21	13.01	0.02

304213

Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-11	Magnesium	3590		1	825.70	660.56	NA	NA
	Manganese	297	J	0.25	17.08	13.66	143.14	0.10
	Mercury	0.39	J	0.143	0.01	0.01	2.11	0.00
	Nickel	5.6	B	Regression	0.16	0.13	65.06	0.00
	Potassium	1410	J	1	324.30	259.44	NA	NA
	Selenium	0.62	U	Regression	0.10	0.08	0.33	0.25
	Silver	0.15	U	0.4	0.01	0.01	29.44	0.00
	Sodium	329	B	0.075	5.68	4.54	NA	NA
	Thallium	0.54	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	44.5		0.0055	0.06	0.05	0.34	0.13
	Zinc	26.4	J	1.5	9.11	7.29	260.25	0.03
	Cyanide	1.2	U	1	0.14	0.11	105.02	0.00
RG-12	Aluminum	6210		0.004	5.71	4.57	1.70	**2.69**
	Antimony	0.49	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.48	BJ	Regression	0.02	0.02	0.11	0.15
	Barium	47	B	0.15	1.62	1.30	8.30	0.16
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.12	B	Regression	0.04	0.03	1.63	0.02
	Calcium	23900		3.5	19239.50	15391.60	NA	NA
	Chromium	9.9		0.041	0.09	0.07	5.34	0.01
	Cobalt	6.1	BJ	0.02	0.03	0.02	8.13	0.00
	Copper	18.1	J	0.4	1.67	1.33	24.74	0.05
	Iron	12500		0.004	11.50	9.20	NA	NA
	Lead	4.7	J	0.3413	0.37	0.30	13.01	0.02
	Magnesium	2560		1	588.80	471.04	NA	NA
	Manganese	313	J	0.25	18.00	14.40	143.14	0.10
	Mercury	0.11	U	0.143	0.00	0.00	2.11	0.00
	Nickel	4.2	B	Regression	0.13	0.10	65.06	0.00
	Potassium	1010	B	1	232.30	185.84	NA	NA
	Selenium	0.61	U	Regression	0.10	0.08	0.33	0.25
	Silver	0.15	U	0.4	0.01	0.01	29.44	0.00
	Sodium	293	B	0.075	5.05	4.04	NA	NA
	Thallium	0.54	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	53		0.0055	0.07	0.05	0.34	0.16
	Zinc	39.1	J	1.5	13.49	10.79	260.25	0.04
	Cyanide	1.2	U	1	0.14	0.11	105.02	0.00
RG-13	Aluminum	14400		0.004	13.25	10.60	1.70	**6.24**
	Antimony	0.47	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	1.1	BJ	Regression	0.04	0.03	0.11	0.26
	Barium	112		0.15	3.86	3.09	8.30	0.37
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.86	B	Regression	0.21	0.17	1.63	0.10
	Calcium	57400		3.5	46207.00	36965.60	NA	NA
	Chromium	21.6		0.041	0.20	0.16	5.34	0.03
	Cobalt	11.9	J	0.02	0.05	0.04	8.13	0.01
	Copper	43.8	J	0.4	4.03	3.22	24.74	0.13

304214

Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-13	Iron	23100		0.004	21.25	17.00	NA	NA
	Lead	22.2	J	0.3413	1.74	1.39	13.01	0.11
	Magnesium	6600		1	1518.00	1214.40	NA	NA
	Manganese	560	J	0.25	32.20	25.76	143.14	0.18
	Mercury	0.11	U	0.143	0.00	0.00	2.11	0.00
	Nickel	11.5	J	Regression	0.27	0.22	65.06	0.00
	Potassium	3020	J	1	694.60	555.68	NA	NA
	Selenium	1.6		Regression	0.66	0.53	0.33	**1.62**
	Silver	0.14	U	0.4	0.01	0.01	29.44	0.00
	Sodium	561	B	0.075	9.68	7.74	NA	NA
	Thallium	0.51	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	70.2		0.0055	0.09	0.07	0.34	0.21
	Zinc	174	J	1.5	60.03	48.02	260.25	0.18
	Cyanide	1.2	U	1	0.14	0.11	105.02	0.00
RG-14	Aluminum	7220	J	0.004	6.64	5.31	1.70	**3.13**
	Antimony	0.83	U	0.04	0.00	0.00	0.11	0.03
	Arsenic	1.5	BJ	Regression	0.04	0.04	0.11	0.32
	Barium	36.5	BJ	0.15	1.26	1.01	8.30	0.12
	Beryllium	0.04	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.04	U	Regression	0.01	0.01	1.63	0.00
	Calcium	97500	J	3.5	78487.50	62790.00	NA	NA
	Chromium	39	J	0.041	0.37	0.29	5.34	0.06
	Cobalt	4.9	BJ	0.02	0.02	0.02	8.13	0.00
	Copper	10.2	BJ	0.4	0.94	0.75	24.74	0.03
	Iron	9160	J	0.004	8.43	6.74	NA	NA
	Lead	3.4	J	0.3413	0.27	0.21	13.01	0.02
	Magnesium	3190	J	1	733.70	586.96	NA	NA
	Manganese	222	J	0.25	12.77	10.21	143.14	0.07
	Mercury	0.18	U	0.143	0.00	0.00	2.11	0.00
	Nickel	17	J	Regression	0.37	0.30	65.06	0.00
	Potassium	706	BJ	1	162.38	129.90	NA	NA
	Selenium	1	U	Regression	0.18	0.14	0.33	0.43
	Silver	0.25	U	0.4	0.01	0.01	29.44	0.00
	Sodium	215	BJ	0.075	3.71	2.97	NA	NA
	Thallium	0.92	U	0.0055	0.00	0.00	0.01	0.04
	Vanadium	28.6	J	0.0055	0.04	0.03	0.34	0.08
	Zinc	21.8	J	1.5	7.52	6.02	260.25	0.02
	Cyanide	2	U	1	0.23	0.18	105.02	0.00
RG-15	Aluminum	3500		0.004	3.22	2.58	1.70	**1.52**
	Antimony	0.46	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.3	U	Regression	0.01	0.01	0.11	0.07
	Barium	23.1	B	0.15	0.80	0.64	8.30	0.08
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.02	U	Regression	0.00	0.00	1.63	0.00
	Calcium	800000		3.5	644000.00	515200.00	NA	NA
	Chromium	4.7		0.041	0.04	0.04	5.34	0.01

304215

Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
RG-15	Cobalt	2.2	BJ	0.02	0.01	0.01	8.13	0.00
	Copper	11.8	J	0.4	1.09	0.87	24.74	0.04
	Iron	4330		0.004	3.98	3.19	NA	NA
	Lead	1.6	J	0.3413	0.13	0.10	13.01	0.01
	Magnesium	1600		1	368.00	294.40	NA	NA
	Manganese	173	J	0.25	9.95	7.96	143.14	0.06
	Mercury	0.11	J	0.143	0.00	0.00	2.11	0.00
	Nickel	1.3	B	Regression	0.05	0.04	65.06	0.00
	Potassium	665	B	1	152.95	122.36	NA	NA
	Selenium	0.57	U	Regression	0.09	0.07	0.33	0.23
	Silver	0.14	U	0.4	0.01	0.01	29.44	0.00
	Sodium	255	B	0.075	4.40	3.52	NA	NA
	Thallium	0.51	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	15		0.0055	0.02	0.02	0.34	0.04
	Zinc	13.6	J	1.5	4.69	3.75	260.25	0.01
	Cyanide	1.1	U	1	0.13	0.10	105.02	0.00
RG-16	Aluminum	5200		0.004	4.78	3.83	1.70	**2.25**
	Antimony	0.53	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.34	U	Regression	0.01	0.01	0.11	0.07
	Barium	21.6	B	0.15	0.75	0.60	8.30	0.07
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.08	B	Regression	0.03	0.02	1.63	0.01
	Calcium	46400		3.5	37352.00	29881.60	NA	NA
	Chromium	5.9		0.041	0.06	0.04	5.34	0.01
	Cobalt	3.1	BJ	0.02	0.01	0.01	8.13	0.00
	Copper	19.9	J	0.4	1.83	1.46	24.74	0.06
	Iron	5780		0.004	5.32	4.25	NA	NA
	Lead	2.2	J	0.3413	0.17	0.14	13.01	0.01
	Magnesium	1660		1	381.80	305.44	NA	NA
	Manganese	196	J	0.25	11.27	9.02	143.14	0.06
	Mercury	0.12	U	0.143	0.00	0.00	2.11	0.00
	Nickel	4.2	B	Regression	0.13	0.10	65.06	0.00
	Potassium	803	B	1	184.69	147.75	NA	NA
	Selenium	0.66	U	Regression	0.11	0.09	0.33	0.27
	Silver	0.16	U	0.4	0.01	0.01	29.44	0.00
	Sodium	492	B	0.075	8.49	6.79	NA	NA
	Thallium	0.58	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	17		0.0055	0.02	0.02	0.34	0.05
	Zinc	25.9	J	1.5	8.94	7.15	260.25	0.03
	Cyanide	1.3	U	1	0.15	0.12	105.02	0.00
95% UCL on mean in River Gut	Aluminum	12778.90		0.004	11.76	9.41	1.70	**5.54**
	Antimony	0.28		0.04	0.00	0.00	0.11	0.02
	Arsenic	0.95		Regression	0.03	0.03	0.11	0.24
	Barium	68.16		0.15	2.35	1.88	8.30	0.23
	Beryllium	0.01		0.01	0.00	0.00	NA	NA
	Cadmium	0.28		Regression	0.08	0.07	1.63	0.04
	Calcium	179734.49		3.5	144686.26	115749.01	NA	NA

304216

Table C-7: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
95% UCL on mean in River Gut	Chromium	18.37		0.041	0.17	0.14	5.34	0.03
	Cobalt	11.53		0.02	0.05	0.04	8.13	0.01
	Copper	35.64		0.4	3.28	2.62	24.74	0.11
	Iron	22110.85		0.004	20.34	16.27	NA	NA
	Lead	11.25		0.3413	0.88	0.71	13.01	0.05
	Magnesium	6717.89		1	1545.11	1236.09	NA	NA
	Manganese	573.08		0.25	32.95	26.36	143.14	0.18
	Mercury	0.21		0.143	0.01	0.01	2.11	0.00
	Nickel	10.56		Regression	0.26	0.21	65.06	0.00
	Potassium	2079.02		1	478.18	382.54	NA	NA
	Selenium	0.73		Regression	0.27	0.22	0.33	0.67
	Silver	0.09		0.4	0.01	0.01	29.44	0.00
	Sodium	560.48		0.075	9.67	7.73	NA	NA
	Thallium	0.31		0.0055	0.00	0.00	0.01	0.03
	Vanadium	60.16		0.0055	0.08	0.06	0.34	0.18
	Zinc	105.62		1.5	36.44	29.15	260.25	0.11
	Cyanide	0.69		1	0.16	0.13	105.02	0.00

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Section 4.2)

* Soil to Plant Uptake Factors: Source is Baes et al., 1987; lead factor is mean UF (Sample et al., 1997).

Regression Models used for arsenic, cadmium, nickel, and selenium (Sample et al., 1997):

arsenic: ln(plant)=-1.915+0.673(ln[soil]); cadmium: ln(plant)=0.04+0.849(ln[soil]); nickel: ln(plant)=-1.663+0.754(ln[soil]

selenium: ln(plant)=0.518+1.136(ln[soil])

Fruits contain an average of 77% moisture content (USEPA, 1993).

U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit used for exposure calculations.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated; nondetect concentration or no benchmark was available.

NA: No benchmark available

304217

APPROVAL TIMESHEETS/FORECAST LISTING

EMPLOYEE NAME	TIMESHEET UTIL%	BILL	OVRT	TOTL	FORECAST UTIL%	1/24	1/31	2/07	2/14	S	A
ALURU, RAVI	93%	37	1	41	0%	0	0	0	0	✓	
CICALESE, MARC E	30%	12	0	40	60%	24	0	0	0	✓	
DOYLE, BRIDGET E	80%	32	0	40	0%	0	0	0	0	✓	
FRANCIS, JOHN R	80%	33	0	41	100%	40	0	0	0	✓	
GRBIC, TOMISLAV J	100%	40	8	48	100%	40	40	0	0	✓	
HALM, SCOTT F	91%	38	4	44	80%	32	0	0	0	✓	
HUNNEWELL, PATRICK T	0%	0	0	40	100%	40	0	0	0	✓	
KING, TREVOR C	100%	40	0	40	100%	40	40	40	40	✓	
MACKIE, BRUCE E	55%	22	0	40	0%	0	0	0	0	✓	
SCHNELL, DEBORAH L	53%	21	0	40	67%	32	16	0	0	✓	
SELVAKUMAR, KUMAR	60%	24	0	40	100%	40	0	0	0	✓	
VENKATRAMAN, SANKAR N	100%	40	0	40	79%	32	30	32	32	✓	
VERKUILEN, MATTHEW F	40%	16	0	40	53%	16	24	24	0	✓	
TOTALS	69%	366	13	534	83%	336	150	96	72		

Table C-8: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
BG-1	Aluminum	15400		0.004	14.17	11.33	1.70	**6.67**
	Antimony	0.61	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	0.39	U	Regression	0.01	0.01	0.11	0.08
	Barium	101		0.15	3.48	2.79	8.30	0.34
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.16	B	Regression	0.05	0.04	1.63	0.02
	Calcium	39800		3.5	32039.00	25631.20	NA	NA
	Chromium	19.7		0.041	0.19	0.15	5.34	0.03
	Cobalt	11.4	BJ	0.02	0.05	0.04	8.13	0.01
	Copper	49.3	J	0.4	4.54	3.63	24.74	0.15
	Iron	20400		0.004	18.77	15.01	NA	NA
	Lead	12.9	J	0.3413	1.01	0.81	13.01	0.06
	Magnesium	5380		1	1237.40	989.92	NA	NA
	Manganese	534	J	0.25	30.71	24.56	143.14	0.17
	Mercury	0.14	U	0.143	0.00	0.00	2.11	0.00
	Nickel	11.7	B	Regression	0.28	0.22	65.06	0.00
	Potassium	3310	J	1	761.30	609.04	NA	NA
	Selenium	0.76	U	Regression	0.13	0.10	0.33	0.32
	Silver	0.18	U	0.4	0.01	0.01	29.44	0.00
	Sodium	660	B	0.075	11.39	9.11	NA	NA
	Thallium	0.67	U	0.0055	0.00	0.00	0.01	0.03
	Vanadium	68.2		0.0055	0.09	0.07	0.34	0.20
	Zinc	58.7	J	1.5	20.25	16.20	260.25	0.06
	Cyanide	1.5	U	1	0.17	0.14	105.02	0.00
BG-2	Aluminum	3990		0.004	3.67	2.94	1.70	**1.73**
	Antimony	0.43	U	0.04	0.00	0.00	0.11	0.01
	Arsenic	0.43	BJ	Regression	0.02	0.02	0.11	0.14
	Barium	63		0.15	2.17	1.74	8.30	0.21
	Beryllium	0.02	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.02	U	Regression	0.00	0.00	1.63	0.00
	Calcium	19800		3.5	15939.00	12751.20	NA	NA

304219

Table C-8: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
BG-2	Chromium	4.6		0.041	0.04	0.03	5.34	0.01
	Cobalt	5.4	BJ	0.02	0.02	0.02	8.13	0.00
	Copper	11.2	J	0.4	1.03	0.82	24.74	0.03
	Iron	5300		0.004	4.88	3.90	NA	NA
	Lead	2.4	J	0.3413	0.19	0.15	13.01	0.01
	Magnesium	1150		1	264.50	211.60	NA	NA
	Manganese	339	J	0.25	19.49	15.59	143.14	0.11
	Mercury	0.1	U	0.143	0.00	0.00	2.11	0.00
	Nickel	3.2	B	Regression	0.10	0.08	65.06	0.00
	Potassium	582	B	1	133.86	107.09	NA	NA
	Selenium	0.53	U	Regression	0.09	0.07	0.33	0.21
	Silver	0.13	U	0.4	0.01	0.00	29.44	0.00
	Sodium	423	B	0.075	7.30	5.84	NA	NA
	Thallium	0.47	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	29.9		0.0055	0.04	0.03	0.34	0.09
	Zinc	13.1	J	1.5	4.52	3.62	260.25	0.01
	Cyanide	1.1	U	1	0.13	0.10	105.02	0.00
Average in Bethlehem Gut	Aluminum	9695		0.004	8.92	7.14	1.70	**4.20**
	Antimony	0.26		0.04	0.00	0.00	0.11	0.02
	Arsenic	0.3125		Regression	0.02	0.01	0.11	0.11
	Barium	82		0.15	2.83	2.26	8.30	0.27
	Beryllium	0.0125		0.01	0.00	0.00	NA	NA
	Cadmium	0.085		Regression	0.03	0.02	1.63	0.01
	Calcium	29800		3.5	23989.00	19191.20	NA	NA
	Chromium	12.15		0.041	0.11	0.09	5.34	0.02
	Cobalt	8.4		0.02	0.04	0.03	8.13	0.00
	Copper	30.25		0.4	2.78	2.23	24.74	0.09
	Iron	12850		0.004	11.82	9.46	NA	NA
	Lead	7.65		0.3413	0.60	0.48	13.01	0.04
	Magnesium	3265		1	750.95	600.76	NA	NA
	Manganese	436.5		0.25	25.10	20.08	143.14	0.14

304220

Table C-8: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
Average in Bethlehem Gut	Mercury	0.06		0.143	0.00	0.00	2.11	0.00
	Nickel	7.45		Regression	0.20	0.16	65.06	0.00
	Potassium	1946		1	447.58	358.06	NA	NA
	Selenium	0.3225		Regression	0.11	0.09	0.33	0.26
	Silver	0.0775		0.4	0.01	0.01	29.44	0.00
	Sodium	541.5		0.075	9.34	7.47	NA	NA
	Thallium	0.285		0.0055	0.00	0.00	0.01	0.02
	Vanadium	49.05		0.0055	0.06	0.05	0.34	0.15
	Zinc	35.9		1.5	12.39	9.91	260.25	0.04
	Cyanide	0.65		1	0.15	0.12	105.02	0.00

Notes:

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Section 4.2)

* Soil to Plant Uptake Factors: Source is Baes et al., 1987; lead factor is mean UF (Sample et al., 1997).

Regression Models used for arsenic, cadmium, nickel, and selenium (Sample et al., 1997):

arsenic: ln(plant)=-1.915+0.673(ln[soil]); cadmium: ln(plant)=0.04+0.849(ln[soil]); nickel: ln(plant)=-1.663+0.754(ln[soil]

selenium: ln(plant)=0.518+1.136(ln[soil])

Fruits were assumed to contain 77% moisture content (USEPA, 1993).

U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit used for exposure calculations.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated; nondetect concentration or no benchmark was available.

NA: No benchmark available

304221

Table C-9: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
FPG-1	Aluminum	10200		0.004	9.38	7.51	1.70	**4.42**
	Antimony	0.52	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	1.4	BJ	Regression	0.04	0.03	0.11	0.31
	Barium	67.4		0.15	2.33	1.86	8.30	0.22
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.09	B	Regression	0.03	0.02	1.63	0.02
	Calcium	36600		3.5	29463.00	23570.40	NA	NA
	Chromium	13.9		0.041	0.13	0.10	5.34	0.02
	Cobalt	8.2	BJ	0.02	0.04	0.03	8.13	0.00
	Copper	33.1	J	0.4	3.05	2.44	24.74	0.10
	Iron	14300		0.004	13.16	10.52	NA	NA
	Lead	8.8	J	0.3413	0.69	0.55	13.01	0.04
	Magnesium	3680		1	846.40	677.12	NA	NA
	Manganese	267	J	0.25	15.35	12.28	143.14	0.09
	Mercury	0.13	U	0.143	0.00	0.00	2.11	0.00
	Nickel	7.7	B	Regression	0.20	0.16	65.06	0.00
	Potassium	2150	J	1	494.50	395.60	NA	NA
	Selenium	1.1	B	Regression	0.43	0.34	0.33	**1.06**
	Silver	0.16	U	0.4	0.01	0.01	29.44	0.00
	Sodium	570	B	0.075	9.83	7.87	NA	NA
	Thallium	0.57	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	54.6		0.0055	0.07	0.06	0.34	0.16
	Zinc	39.4	J	1.5	13.59	10.87	260.25	0.04
	Cyanide	1.3	U	1	0.15	0.12	105.02	0.00
FPG-2	Aluminum	9750		0.004	8.97	7.18	1.70	**4.22**
	Antimony	0.51	U	0.04	0.00	0.00	0.11	0.02
	Arsenic	2.8	J	Regression	0.07	0.05	0.11	0.49
	Barium	70		0.15	2.42	1.93	8.30	0.23
	Beryllium	0.03	U	0.01	0.00	0.00	NA	NA
	Cadmium	0.2	B	Regression	0.06	0.05	1.63	0.03
	Calcium	25300		3.5	20366.50	16293.20	NA	NA

304222

Table C-9: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
FPG-2	Chromium	13.9		0.041	0.13	0.10	5.34	0.02
	Cobalt	8.6	BJ	0.02	0.04	0.03	8.13	0.00
	Copper	33.2	J	0.4	3.05	2.44	24.74	0.10
	Iron	14800		0.004	13.62	10.89	NA	NA
	Lead	5.7	J	0.3413	0.45	0.36	13.01	0.03
	Magnesium	3670		1	844.10	675.28	NA	NA
	Manganese	332	J	0.25	19.09	15.27	143.14	0.11
	Mercury	0.12	U	0.143	0.00	0.00	2.11	0.00
	Nickel	6.9	B	Regression	0.19	0.15	65.06	0.00
	Potassium	1940	J	1	446.20	356.96	NA	NA
	Selenium	0.63	U	Regression	0.10	0.08	0.33	0.26
	Silver	0.15	U	0.4	0.01	0.01	29.44	0.00
	Sodium	887	B	0.075	15.30	12.24	NA	NA
	Thallium	0.56	U	0.0055	0.00	0.00	0.01	0.02
	Vanadium	56.5		0.0055	0.07	0.06	0.34	0.17
	Zinc	34.2	J	1.5	11.80	9.44	260.25	0.04
	Cyanide	1.2	U	1	0.14	0.11	105.02	0.00
Average in Fair Plain Gut	Aluminum	9975		0.004	9.18	7.34	1.70	**4.32**
	Antimony	0.2575		0.04	0.00	0.00	0.11	0.02
	Arsenic	2.1		Regression	0.06	0.04	0.11	0.40
	Barium	68.7		0.15	2.37	1.90	8.30	0.23
	Beryllium	0.015		0.01	0.00	0.00	NA	NA
	Cadmium	0.145		Regression	0.05	0.04	1.63	0.02
	Calcium	30950		3.5	24914.75	19931.80	NA	NA
	Chromium	13.9		0.041	0.13	0.10	5.34	0.02
	Cobalt	8.4		0.02	0.04	0.03	8.13	0.00
	Copper	33.15		0.4	3.05	2.44	24.74	0.10
	Iron	14550		0.004	13.39	10.71	NA	NA
	Lead	7.25		0.3413	0.57	0.46	13.01	0.03
	Magnesium	3675		1	845.25	676.20	NA	NA
	Manganese	299.5		0.25	17.22	13.78	143.14	0.10

304223

Table C-9: Estimated Chemical Exposure for the Jamaican Fruit Bat Compared to Ecotoxicological Benchmarks Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Plant Uptake Factor*	Fruit Concentration (mg/kg)	Exposure (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
Average in Fair Plain Gut	Mercury	0.0625		0.143	0.00	0.00	2.11	0.00
	Nickel	7.3		Regression	0.20	0.16	65.06	0.00
	Potassium	2045		1	470.35	376.28	NA	NA
	Selenium	0.7075		Regression	0.26	0.21	0.33	0.64
	Silver	0.0775		0.4	0.01	0.01	29.44	0.00
	Sodium	728.5		0.075	12.57	10.05	NA	NA
	Thallium	0.2825		0.0055	0.00	0.00	0.01	0.02
	Vanadium	55.55		0.0055	0.07	0.06	0.34	0.16
	Zinc	36.8		1.5	12.70	10.16	260.25	0.04
	Cyanide	0.625		1	0.14	0.12	105.02	0.00

Notes:

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Section 4.2)

* Soil to Plant Uptake Factors: Source is Baes et al., 1987; lead factor is mean UF (Sample et al., 1997).

Regression Models used for arsenic, cadmium, nickel, and selenium (Sample et al., 1997):

arsenic: ln(plant)=-1.915+0.673(ln[soil]); cadmium: ln(plant)=0.04+0.849(ln[soil]); nickel: ln(plant)=-1.663+0.754(ln[soil]

selenium: ln(plant)=0.518+1.136(ln[soil])

Fruits were assumed to contain 77% moisture content (USEPA, 1993).

U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit used for exposure calculations.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated; nondetect concentration or no benchmark was available.

NA: No benchmark available

304224

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-2	Aluminum	15500		1	2480.000	2232.000	1906.500	4138.500	109.70	**37.73**
	Antimony	0.53	U	1	0.042	0.038	0.033	0.071	NA	NA
	Arsenic	1.6	BJ	Regression	0.044	0.040	0.197	0.237	5.10	0.05
	Barium	70.6		1	11.296	10.166	8.684	18.850	20.80	0.91
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.19	BJ	Regression	1.076	0.969	0.023	0.992	1.45	0.68
	Calcium	24500		1	3920.000	3528.000	3013.500	6541.500	NA	NA
	Chromium	16.1		Regression	1.170	1.053	1.980	3.034	1.00	**3.03**
	Cobalt	14.8	J	1	2.368	2.131	1.820	3.952	NA	NA
	Copper	40.5	J	Regression	2.379	2.141	4.982	7.123	47.00	0.15
	Iron	26800		1	4288.000	3859.200	3296.400	7155.600	NA	NA
	Lead	5.9	J	6.33	5.976	5.378	0.726	6.104	3.85	**1.59**
	Magnesium	7650		1	1224.000	1101.600	940.950	2042.550	NA	NA
	Manganese	594	J	0.07	6.653	5.988	73.062	79.050	977.00	0.08
	Mercury	0.13	U	Regression	0.069	0.062	0.008	0.070	0.45	0.16
	Nickel	9.4	B	0.92	1.384	1.245	1.156	2.402	77.40	0.03
	Potassium	2230	J	1	356.800	321.120	274.290	595.410	NA	NA
	Selenium	0.68	B	1	0.109	0.098	0.084	0.182	0.40	0.45
	Silver	0.16	U	1	0.013	0.012	0.010	0.021	NA	NA
	Sodium	543	B	1	86.880	78.192	66.789	144.981	NA	NA
	Thallium	0.58	U	1	0.046	0.042	0.036	0.077	0.12	0.65
	Vanadium	69.2		1	11.072	9.965	8.512	18.476	11.40	**1.62**
	Zinc	140	J	Regression	84.620	76.158	17.220	93.378	14.50	**6.44**
	Cyanide	1.3	U	1	0.104	0.094	0.080	0.174	NA	NA
RG-2D	Aluminum	17700		1	2832.000	2548.800	2177.100	4725.900	109.70	**43.08**
	Antimony	0.52	U	1	0.042	0.037	0.032	0.069	NA	NA
	Arsenic	0.34	U	Regression	0.005	0.004	0.021	0.025	5.10	0.00
	Barium	89		1	14.240	12.816	10.947	23.763	20.80	**1.14**
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.3	B	Regression	1.385	1.246	0.037	1.283	1.45	0.88
	Calcium	28700		1	4592.000	4132.800	3530.100	7662.900	NA	NA
	Chromium	19.4		Regression	1.139	1.025	2.386	3.411	1.00	**3.41**
	Cobalt	16.8	J	1	2.688	2.419	2.066	4.486	NA	NA
	Copper	54.4	J	Regression	2.555	2.299	6.691	8.991	47.00	0.19
	Iron	30900		1	4944.000	4449.600	3800.700	8250.300	NA	NA
	Lead	8.2	J	6.33	8.305	7.474	1.009	8.483	3.85	**2.20**
	Magnesium	9070		1	1451.200	1306.080	1115.610	2421.690	NA	NA
	Manganese	675	J	0.07	7.560	6.804	83.025	89.829	977.00	0.09
	Mercury	0.13	U	Regression	0.069	0.062	0.008	0.070	0.45	0.16
	Nickel	13.8	J	0.92	2.031	1.828	1.697	3.526	77.40	0.05
	Potassium	3300	J	1	528.000	475.200	405.900	881.100	NA	NA
	Selenium	0.65	U	1	0.052	0.047	0.040	0.087	0.40	0.22
	Silver	0.16	U	1	0.013	0.012	0.010	0.021	NA	NA
	Sodium	697	B	1	111.520	100.368	85.731	186.099	NA	NA
	Thallium	0.57	U	1	0.046	0.041	0.035	0.076	0.12	0.63
	Vanadium	81		1	12.960	11.664	9.963	21.627	11.40	**1.90**
	Zinc	263	J	Regression	98.277	88.449	32.349	120.798	14.50	**8.33**
	Cyanide	1.3	U	1	0.104	0.094	0.080	0.174	NA	NA

304225

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-3	Aluminum	14900		1	2384.000	2145.600	1832.700	3978.300	109.70	**36.27**
	Antimony	0.53	U	1	0.042	0.038	0.033	0.071	NA	NA
	Arsenic	0.86	BJ	Regression	0.024	0.022	0.106	0.127	5.10	0.02
	Barium	53.8		1	8.608	7.747	6.617	14.365	20.80	0.69
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.31	B	Regression	1.410	1.269	0.038	1.307	1.45	0.90
	Calcium	39300		1	6288.000	5659.200	4833.900	10493.100	NA	NA
	Chromium	14.8		Regression	1.185	1.066	1.820	2.887	1.00	**2.89**
	Cobalt	13.8	J	1	2.208	1.987	1.697	3.685	NA	NA
	Copper	38.8	J	Regression	2.355	2.119	4.772	6.892	47.00	0.15
	Iron	27300		1	4368.000	3931.200	3357.900	7289.100	NA	NA
	Lead	4.1	J	6.33	4.152	3.737	0.504	4.242	3.85	**1.10**
	Magnesium	8600		1	1376.000	1238.400	1057.800	2296.200	NA	NA
	Manganese	792	J	0.07	8.870	7.983	97.416	105.399	977.00	0.11
	Mercury	0.13	U	Regression	0.069	0.062	0.008	0.070	0.45	0.16
	Nickel	10.3	B	0.92	1.516	1.365	1.267	2.631	77.40	0.03
	Potassium	1500	J	1	240.000	216.000	184.500	400.500	NA	NA
	Selenium	0.66	U	1	0.053	0.048	0.041	0.088	0.40	0.22
	Silver	0.16	U	1	0.013	0.012	0.010	0.021	NA	NA
	Sodium	525	B	1	84.000	75.600	64.575	140.175	NA	NA
	Thallium	0.58	U	1	0.046	0.042	0.036	0.077	0.12	0.65
	Vanadium	59.6		1	9.536	8.582	7.331	15.913	11.40	**1.40**
	Zinc	54.4	J	Regression	67.617	60.855	6.691	67.546	14.50	**4.66**
	Cyanide	1.3	U	1	0.104	0.094	0.080	0.174	NA	NA
RG-4	Aluminum	14400		1	2304.000	2073.600	1771.200	3844.800	109.70	**35.05**
	Antimony	0.49	U	1	0.039	0.035	0.030	0.065	NA	NA
	Arsenic	1.2	BJ	Regression	0.033	0.030	0.148	0.178	5.10	0.03
	Barium	58.4		1	9.344	8.410	7.183	15.593	20.80	0.75
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.21	B	Regression	1.137	1.024	0.026	1.050	1.45	0.72
	Calcium	51000		1	8160.000	7344.000	6273.000	13617.000	NA	NA
	Chromium	12		Regression	1.222	1.100	1.476	2.576	1.00	**2.58**
	Cobalt	12.8	J	1	2.048	1.843	1.574	3.418	NA	NA
	Copper	33	J	Regression	2.265	2.038	4.059	6.097	47.00	0.13
	Iron	22700		1	3632.000	3268.800	2792.100	6060.900	NA	NA
	Lead	14.1	J	6.33	14.280	12.852	1.734	14.587	3.85	**3.79**
	Magnesium	6920		1	1107.200	996.480	851.160	1847.640	NA	NA
	Manganese	726	J	0.07	8.131	7.318	89.298	96.616	977.00	0.10
	Mercury	0.33		Regression	0.119	0.107	0.041	0.148	0.45	0.33
	Nickel	9.8	J	0.92	1.443	1.298	1.205	2.504	77.40	0.03
	Potassium	1310	J	1	209.600	188.640	161.130	349.770	NA	NA
	Selenium	0.61	U	1	0.049	0.044	0.038	0.081	0.40	0.20
	Silver	0.15	U	1	0.012	0.011	0.009	0.020	NA	NA
	Sodium	639	B	1	102.240	92.016	78.597	170.613	NA	NA
	Thallium	0.54	U	1	0.043	0.039	0.033	0.072	0.12	0.60

304226

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-4	Vanadium	49.2		1	7.872	7.085	6.052	13.136	11.40	**1.15**
	Zinc	50.8	J	Regression	66.527	59.874	6.248	66.123	14.50	**4.56**
	Cyanide	1.2	U	1	0.096	0.086	0.074	0.160	NA	NA
RG-4D	Aluminum	9210		1	1473.600	1326.240	1132.830	2459.070	109.70	**22.42**
	Antimony	0.53	U	1	0.042	0.038	0.033	0.071	NA	NA
	Arsenic	0.34	U	Regression	0.005	0.004	0.021	0.025	5.10	0.00
	Barium	36.3	B	1	5.808	5.227	4.465	9.692	20.80	0.47
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.11	B	Regression	0.796	0.717	0.014	0.730	1.45	0.50
	Calcium	30700		1	4912.000	4420.800	3776.100	8196.900	NA	NA
	Chromium	8		Regression	1.296	1.167	0.984	2.151	1.00	**2.15**
	Cobalt	8	BJ	1	1.280	1.152	0.984	2.136	NA	NA
	Copper	19.6	J	Regression	1.997	1.797	2.411	4.208	47.00	0.09
	Iron	14500		1	2320.000	2088.000	1783.500	3871.500	NA	NA
	Lead	3.1	J	6.33	3.140	2.826	0.381	3.207	3.85	0.83
	Magnesium	4700		1	752.000	676.800	578.100	1254.900	NA	NA
	Manganese	445	J	0.07	4.984	4.486	54.735	59.221	977.00	0.06
	Mercury	0.19	J	Regression	0.099	0.089	0.023	0.112	0.45	0.25
	Nickel	6.1	B	0.92	0.898	0.808	0.750	1.558	77.40	0.02
	Potassium	754	B	1	120.640	108.576	92.742	201.318	NA	NA
	Selenium	1	B	1	0.160	0.144	0.123	0.267	0.40	0.67
	Silver	0.16	U	1	0.013	0.012	0.010	0.021	NA	NA
	Sodium	509	B	1	81.440	73.296	62.607	135.903	NA	NA
	Thallium	0.58	U	1	0.046	0.042	0.036	0.077	0.12	0.65
	Vanadium	32.7		1	5.232	4.709	4.022	8.731	11.40	0.77
	Zinc	42.6	J	Regression	63.805	57.425	5.240	62.664	14.50	**4.32**
	Cyanide	1.3	U	1	0.104	0.094	0.080	0.174	NA	NA
RG-5	Aluminum	11200		1	1792.000	1612.800	1377.600	2990.400	109.70	**27.26**
	Antimony	0.47	U	1	0.038	0.034	0.029	0.063	NA	NA
	Arsenic	0.91	BJ	Regression	0.025	0.023	0.112	0.135	5.10	0.03
	Barium	43.5	B	1	6.960	6.264	5.351	11.615	20.80	0.56
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.15	B	Regression	0.945	0.850	0.018	0.869	1.45	0.60
	Calcium	81100		1	12976.000	11678.400	9975.300	21653.700	NA	NA
	Chromium	14.6		Regression	1.187	1.069	1.796	2.864	1.00	**2.86**
	Cobalt	10.3	BJ	1	1.648	1.483	1.267	2.750	NA	NA
	Copper	32.9	J	Regression	2.263	2.037	4.047	6.083	47.00	0.13
	Iron	22300		1	3568.000	3211.200	2742.900	5954.100	NA	NA
	Lead	26.1	J	6.33	26.434	23.791	3.210	27.001	3.85	**7.01**
	Magnesium	7630		1	1220.800	1098.720	938.490	2037.210	NA	NA
	Manganese	598	J	0.07	6.698	6.028	73.554	79.582	977.00	0.08
	Mercury	0.13	J	Regression	0.087	0.078	0.016	0.094	0.45	0.21
	Nickel	9.6	J	0.92	1.413	1.272	1.181	2.453	77.40	0.03
	Potassium	1290	J	1	206.400	185.760	158.670	344.430	NA	NA
	Selenium	0.98	B	1	0.157	0.141	0.121	0.262	0.40	0.65
	Silver	0.14	U	1	0.011	0.010	0.009	0.019	NA	NA
	Sodium	580	B	1	92.800	83.520	71.340	154.860	NA	NA

3042227

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-5	Thallium	0.52	U	1	0.042	0.037	0.032	0.069	0.12	0.58
	Vanadium	48.1		1	7.696	6.926	5.916	12.843	11.40	**1.13**
	Zinc	67.8	J	Regression	71.244	64.119	8.339	72.459	14.50	**5.00**
	Cyanide	1.2	U	1	0.096	0.086	0.074	0.160	NA	NA
RG-6	Aluminum	10500		1	1680.000	1512.000	1291.500	2803.500	109.70	**25.56**
	Antimony	0.46	U	1	0.037	0.033	0.028	0.061	NA	NA
	Arsenic	0.36	BJ	Regression	0.010	0.009	0.044	0.053	5.10	0.01
	Barium	43.5	B	1	6.960	6.264	5.351	11.615	20.80	0.56
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.13	B	Regression	0.873	0.786	0.016	0.802	1.45	0.55
	Calcium	57000		1	9120.000	8208.000	7011.000	15219.000	NA	NA
	Chromium	14.4		Regression	1.190	1.071	1.771	2.842	1.00	**2.84**
	Cobalt	9.5	BJ	1	1.520	1.368	1.169	2.537	NA	NA
	Copper	29.6	J	Regression	2.206	1.985	3.641	5.626	47.00	0.12
	Iron	19800		1	3168.000	2851.200	2435.400	5286.600	NA	NA
	Lead	11.4	J	6.33	11.546	10.391	1.402	11.794	3.85	**3.06**
	Magnesium	6700		1	1072.000	964.800	824.100	1788.900	NA	NA
	Manganese	513	J	0.07	5.746	5.171	63.099	68.270	977.00	0.07
	Mercury	0.22	J	Regression	0.104	0.093	0.027	0.121	0.45	0.27
	Nickel	10.6	J	0.92	1.560	1.404	1.304	2.708	77.40	0.03
	Potassium	1250	J	1	200.000	180.000	153.750	333.750	NA	NA
	Selenium	0.57	U	1	0.046	0.041	0.035	0.076	0.40	0.19
	Silver	0.14	U	1	0.011	0.010	0.009	0.019	NA	NA
	Sodium	474	B	1	75.840	68.256	58.302	126.558	NA	NA
	Thallium	0.51	U	1	0.041	0.037	0.031	0.068	0.12	0.57
	Vanadium	51.4		1	8.224	7.402	6.322	13.724	11.40	**1.20**
	Zinc	45.9	J	Regression	64.945	58.450	5.646	64.096	14.50	**4.42**
	Cyanide	1.1	U	1	0.088	0.079	0.068	0.147	NA	NA
RG-7	Aluminum	11500		1	1840.000	1656.000	1414.500	3070.500	109.70	**27.99**
	Antimony	0.53	U	1	0.042	0.038	0.033	0.071	NA	NA
	Arsenic	0.92	BJ	Regression	0.026	0.023	0.113	0.136	5.10	0.03
	Barium	68		1	10.880	9.792	8.364	18.156	20.80	0.87
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.19	B	Regression	1.076	0.969	0.023	0.992	1.45	0.68
	Calcium	42900		1	6864.000	6177.600	5276.700	11454.300	NA	NA
	Chromium	13.6		Regression	1.200	1.080	1.673	2.753	1.00	**2.75**
	Cobalt	11	BJ	1	1.760	1.584	1.353	2.937	NA	NA
	Copper	34.1	J	Regression	2.283	2.054	4.194	6.249	47.00	0.13
	Iron	21100		1	3376.000	3038.400	2595.300	5633.700	NA	NA
	Lead	5.9	J	6.33	5.976	5.378	0.726	6.104	3.85	**1.59**
	Magnesium	6040		1	966.400	869.760	742.920	1612.680	NA	NA
	Manganese	531	J	0.07	5.947	5.352	65.313	70.665	977.00	0.07
	Mercury	0.11	U	Regression	0.065	0.059	0.007	0.065	0.45	0.15
	Nickel	8.2	B	0.92	1.207	1.086	1.009	2.095	77.40	0.03
	Potassium	1750	J	1	280.000	252.000	215.250	467.250	NA	NA
	Selenium	0.66	U	1	0.053	0.048	0.041	0.088	0.40	0.22

304228

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-7	Silver	0.16	U	1	0.013	0.012	0.010	0.021	NA	NA
	Sodium	479	B	1	76.640	68.976	58.917	127.893	NA	NA
	Thallium	0.58	U	1	0.046	0.042	0.036	0.077	0.12	0.65
	Vanadium	63.8		1	10.208	9.187	7.847	17.035	11.40	**1.49**
	Zinc	43.4	J	Regression	64.087	57.679	5.338	63.017	14.50	**4.35**
	Cyanide	1.3	U	1	0.104	0.094	0.080	0.174	NA	NA
RG-8	Aluminum	10200		1	1632.000	1468.800	1254.600	2723.400	109.70	**24.83**
	Antimony	0.48	U	1	0.038	0.035	0.030	0.064	NA	NA
	Arsenic	0.31	U	Regression	0.004	0.004	0.019	0.023	5.10	0.00
	Barium	53		1	8.480	7.632	6.519	14.151	20.80	0.68
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.03	B	Regression	0.389	0.350	0.004	0.354	1.45	0.24
	Calcium	48700		1	7792.000	7012.800	5990.100	13002.900	NA	NA
	Chromium	10.8		Regression	1.241	1.117	1.328	2.445	1.00	**2.45**
	Cobalt	8.1	BJ	1	1.296	1.166	0.996	2.163	NA	NA
	Copper	25.1	J	Regression	2.120	1.908	3.087	4.995	47.00	0.11
	Iron	15800		1	2528.000	2275.200	1943.400	4218.600	NA	NA
	Lead	4.5	J	6.33	4.558	4.102	0.554	4.655	3.85	**1.21**
	Magnesium	5320		1	851.200	766.080	654.360	1420.440	NA	NA
	Manganese	408	J	0.07	4.570	4.113	50.184	54.297	977.00	0.06
	Mercury	0.19	J	Regression	0.099	0.089	0.023	0.112	0.45	0.25
	Nickel	6.5	B	0.92	0.957	0.861	0.800	1.661	77.40	0.02
	Potassium	1910	J	1	305.600	275.040	234.930	509.970	NA	NA
	Selenium	0.6	U	1	0.048	0.043	0.037	0.080	0.40	0.20
	Silver	0.14	U	1	0.011	0.010	0.009	0.019	NA	NA
	Sodium	522	B	1	83.520	75.168	64.206	139.374	NA	NA
	Thallium	0.52	U	1	0.042	0.037	0.032	0.069	0.12	0.58
	Vanadium	44.8		1	7.168	6.451	5.510	11.962	11.40	**1.05**
	Zinc	34.9	J	Regression	60.857	54.771	4.293	59.064	14.50	**4.07**
	Cyanide	1.2	U	1	0.096	0.086	0.074	0.160	NA	NA
RG-9	Aluminum	15400		1	2464.000	2217.600	1894.200	4111.800	109.70	**37.48**
	Antimony	0.56	U	1	0.045	0.040	0.034	0.075	NA	NA
	Arsenic	1.1	BJ	Regression	0.031	0.028	0.135	0.163	5.10	0.03
	Barium	98.5		1	15.760	14.184	12.116	26.300	20.80	**1.26**
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.32	B	Regression	1.435	1.291	0.039	1.331	1.45	0.92
	Calcium	56200		1	8992.000	8092.800	6912.600	15005.400	NA	NA
	Chromium	20.2		Regression	1.132	1.019	2.485	3.504	1.00	**3.50**
	Cobalt	14.4	J	1	2.304	2.074	1.771	3.845	NA	NA
	Copper	47.2	J	Regression	2.469	2.222	5.806	8.028	47.00	0.17
	Iron	27500		1	4400.000	3960.000	3382.500	7342.500	NA	NA
	Lead	6.3	J	6.33	6.381	5.743	0.775	6.517	3.85	**1.69**
	Magnesium	8270		1	1323.200	1190.880	1017.210	2208.090	NA	NA
	Manganese	708	J	0.07	7.930	7.137	87.084	94.221	977.00	0.10
	Mercury	0.34	J	Regression	0.120	0.108	0.042	0.150	0.45	0.33
	Nickel	12.4	J	0.92	1.825	1.643	1.525	3.168	77.40	0.04
	Potassium	3540	J	1	566.400	509.760	435.420	945.180	NA	NA

304229

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-9	Selenium	0.69	U	1	0.055	0.050	0.042	0.092	0.40	0.23
	Silver	0.17	U	1	0.014	0.012	0.010	0.023	NA	NA
	Sodium	668	B	1	106.880	96.192	82.164	178.356	NA	NA
	Thallium	0.61	U	1	0.049	0.044	0.038	0.081	0.12	0.68
	Vanadium	85.9		1	13.744	12.370	10.566	22.935	11.40	**2.01**
	Zinc	155	J	Regression	86.689	78.020	19.065	97.085	14.50	**6.70**
	Cyanide	1.4	U	1	0.112	0.101	0.086	0.187	NA	NA
RG-10	Aluminum	9500		1	1520.000	1368.000	1168.500	2536.500	109.70	**23.12**
	Antimony	0.52	U	1	0.042	0.037	0.032	0.069	NA	NA
	Arsenic	1	BJ	Regression	0.028	0.025	0.123	0.148	5.10	0.03
	Barium	52.6		1	8.416	7.574	6.470	14.044	20.80	0.68
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.11	B	Regression	0.796	0.717	0.014	0.730	1.45	0.50
	Calcium	56700		1	9072.000	8164.800	6974.100	15138.900	NA	NA
	Chromium	13.9		Regression	1.196	1.076	1.710	2.786	1.00	**2.79**
	Cobalt	7.4	BJ	1	1.184	1.066	0.910	1.976	NA	NA
	Copper	23.7	J	Regression	2.091	1.882	2.915	4.797	47.00	0.10
	Iron	16000		1	2560.000	2304.000	1968.000	4272.000	NA	NA
	Lead	8.2	J	6.33	8.305	7.474	1.009	8.483	3.85	**2.20**
	Magnesium	4610		1	737.600	663.840	567.030	1230.870	NA	NA
	Manganese	431	J	0.07	4.827	4.344	53.013	57.357	977.00	0.06
	Mercury	0.25	J	Regression	0.108	0.098	0.031	0.128	0.45	0.29
	Nickel	7.6	B	0.92	1.119	1.007	0.935	1.942	77.40	0.03
	Potassium	1650	J	1	264.000	237.600	202.950	440.550	NA	NA
	Selenium	1.1	B	1	0.176	0.158	0.135	0.294	0.40	0.73
	Silver	0.16	U	1	0.013	0.012	0.010	0.021	NA	NA
	Sodium	599	B	1	95.840	86.256	73.677	159.933	NA	NA
	Thallium	0.57	U	1	0.046	0.041	0.035	0.076	0.12	0.63
	Vanadium	46.3		1	7.408	6.667	5.695	12.362	11.40	**1.08**
	Zinc	44	J	Regression	64.297	57.867	5.412	63.279	14.50	**4.36**
	Cyanide	1.3	U	1	0.104	0.094	0.080	0.174	NA	NA
RG-11	Aluminum	7680		1	1228.800	1105.920	944.640	2050.560	109.70	**18.69**
	Antimony	0.49	U	1	0.039	0.035	0.030	0.065	NA	NA
	Arsenic	0.38	BJ	Regression	0.011	0.010	0.047	0.056	5.10	0.01
	Barium	50.6		1	8.096	7.286	6.224	13.510	20.80	0.65
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.05	B	Regression	0.516	0.464	0.006	0.470	1.45	0.32
	Calcium	32000		1	5120.000	4608.000	3936.000	8544.000	NA	NA
	Chromium	10.1		Regression	1.253	1.128	1.242	2.370	1.00	**2.37**
	Cobalt	6.7	BJ	1	1.072	0.965	0.824	1.789	NA	NA
	Copper	22	J	Regression	2.053	1.848	2.706	4.554	47.00	0.10
	Iron	12700		1	2032.000	1828.800	1562.100	3390.900	NA	NA
	Lead	3.4	J	6.33	3.444	3.099	0.418	3.517	3.85	0.91
	Magnesium	3590		1	574.400	516.960	441.570	958.530	NA	NA
	Manganese	297	J	0.07	3.326	2.994	36.531	39.525	977.00	0.04
	Mercury	0.39	J	Regression	0.126	0.113	0.048	0.161	0.45	0.36
	Nickel	5.6	B	0.92	0.824	0.742	0.689	1.431	77.40	0.02

304230

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-11	Potassium	1410	J	1	225.600	203.040	173.430	376.470	NA	NA
	Selenium	0.62	U	1	0.050	0.045	0.038	0.083	0.40	0.21
	Silver	0.15	U	1	0.012	0.011	0.009	0.020	NA	NA
	Sodium	329	B	1	52.640	47.376	40.467	87.843	NA	NA
	Thallium	0.54	U	1	0.043	0.039	0.033	0.072	0.12	0.60
	Vanadium	44.5		1	7.120	6.408	5.474	11.882	11.40	**1.04**
	Zinc	26.4	J	Regression	56.956	51.261	3.247	54.508	14.50	**3.76**
	Cyanide	1.2	U	1	0.096	0.086	0.074	0.160	NA	NA
RG-12	Aluminum	6210		1	993.600	894.240	763.830	1658.070	109.70	**15.11**
	Antimony	0.49	U	1	0.039	0.035	0.030	0.065	NA	NA
	Arsenic	0.48	BJ	Regression	0.014	0.012	0.059	0.071	5.10	0.01
	Barium	47	B	1	7.520	6.768	5.781	12.549	20.80	0.60
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.12	B	Regression	0.836	0.752	0.015	0.767	1.45	0.53
	Calcium	23900		1	3824.000	3441.600	2939.700	6381.300	NA	NA
	Chromium	9.9		Regression	1.257	1.131	1.218	2.349	1.00	**2.35**
	Cobalt	6.1	BJ	1	0.976	0.878	0.750	1.629	NA	NA
	Copper	18.1	J	Regression	1.959	1.763	2.226	3.989	47.00	0.08
	Iron	12500		1	2000.000	1800.000	1537.500	3337.500	NA	NA
	Lead	4.7	J	6.33	4.760	4.284	0.578	4.862	3.85	**1.26**
	Magnesium	2560		1	409.600	368.640	314.880	683.520	NA	NA
	Manganese	313	J	0.07	3.506	3.155	38.499	41.654	977.00	0.04
	Mercury	0.11	U	Regression	0.065	0.059	0.007	0.065	0.45	0.15
	Nickel	4.2	B	0.92	0.618	0.556	0.517	1.073	77.40	0.01
	Potassium	1010	B	1	161.600	145.440	124.230	269.670	NA	NA
	Selenium	0.61	U	1	0.049	0.044	0.038	0.081	0.40	0.20
	Silver	0.15	U	1	0.012	0.011	0.009	0.020	NA	NA
	Sodium	293	B	1	46.880	42.192	36.039	78.231	NA	NA
	Thallium	0.54	U	1	0.043	0.039	0.033	0.072	0.12	0.60
	Vanadium	53		1	8.480	7.632	6.519	14.151	11.40	**1.24**
	Zinc	39.1	J	Regression	62.520	56.268	4.809	61.077	14.50	**4.21**
	Cyanide	1.2	U	1	0.096	0.086	0.074	0.160	NA	NA
RG-13	Aluminum	14400		1	2304.000	2073.600	1771.200	3844.800	109.70	**35.05**
	Antimony	0.47	U	1	0.038	0.034	0.029	0.063	NA	NA
	Arsenic	1.1	BJ	Regression	0.031	0.028	0.135	0.163	5.10	0.03
	Barium	112		1	17.920	16.128	13.776	29.904	20.80	**1.44**
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.86	B	Regression	2.474	2.227	0.106	2.332	1.45	**1.61**
	Calcium	57400		1	9184.000	8265.600	7060.200	15325.800	NA	NA
	Chromium	21.6		Regression	1.121	1.009	2.657	3.666	1.00	**3.67**
	Cobalt	11.9	J	1	1.904	1.714	1.464	3.177	NA	NA
	Copper	43.8	J	Regression	2.425	2.182	5.387	7.570	47.00	0.16
	Iron	23100		1	3696.000	3326.400	2841.300	6167.700	NA	NA
	Lead	22.2	J	6.33	22.484	20.236	2.731	22.966	3.85	**5.97**
	Magnesium	6600		1	1056.000	950.400	811.800	1762.200	NA	NA
	Manganese	560	J	0.07	6.272	5.645	68.880	74.525	977.00	0.08
	Mercury	0.11	U	Regression	0.065	0.059	0.007	0.065	0.45	0.15

304231

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-13	Nickel	11.5	J	0.92	1.693	1.524	1.415	2.938	77.40	0.04
	Potassium	3020	J	1	483.200	434.880	371.460	806.340	NA	NA
	Selenium	1.6		1	0.256	0.230	0.197	0.427	0.40	**1.07**
	Silver	0.14	U	1	0.011	0.010	0.009	0.019	NA	NA
	Sodium	561	B	1	89.760	80.784	69.003	149.787	NA	NA
	Thallium	0.51	U	1	0.041	0.037	0.031	0.068	0.12	0.57
	Vanadium	70.2		1	11.232	10.109	8.635	18.743	11.40	**1.64**
	Zinc	174	J	Regression	89.100	80.190	21.402	101.592	14.50	**7.01**
	Cyanide	1.2	U	1	0.096	0.086	0.074	0.160	NA	NA
RG-14	Aluminum	7220	J	1	1155.200	1039.680	888.060	1927.740	109.70	**17.57**
	Antimony	0.83	U	1	0.066	0.060	0.051	0.111	NA	NA
	Arsenic	1.5	BJ	Regression	0.042	0.037	0.185	0.222	5.10	0.04
	Barium	36.5	BJ	1	5.840	5.256	4.490	9.746	20.80	0.47
	Beryllium	0.04	U	1	0.003	0.003	0.002	0.005	NA	NA
	Cadmium	0.04	U	Regression	0.311	0.280	0.002	0.283	1.45	0.19
	Calcium	97500	J	1	15600.000	14040.000	11992.500	26032.500	NA	NA
	Chromium	39	J	Regression	1.029	0.926	4.797	5.723	1.00	**5.72**
	Cobalt	4.9	BJ	1	0.784	0.706	0.603	1.308	NA	NA
	Copper	10.2	BJ	Regression	1.706	1.535	1.255	2.790	47.00	0.06
	Iron	9160	J	1	1465.600	1319.040	1126.680	2445.720	NA	NA
	Lead	3.4	J	6.33	3.444	3.099	0.418	3.517	3.85	0.91
	Magnesium	3190	J	1	510.400	459.360	392.370	851.730	NA	NA
	Manganese	222	J	0.07	2.486	2.238	27.306	29.544	977.00	0.03
	Mercury	0.18	U	Regression	0.077	0.069	0.011	0.080	0.45	0.18
	Nickel	17	J	0.92	2.502	2.252	2.091	4.343	77.40	0.06
	Potassium	706	BJ	1	112.960	101.664	86.838	188.502	NA	NA
	Selenium	1	U	1	0.080	0.072	0.062	0.134	0.40	0.33
	Silver	0.25	U	1	0.020	0.018	0.015	0.033	NA	NA
	Sodium	215	BJ	1	34.400	30.960	26.445	57.405	NA	NA
	Thallium	0.92	U	1	0.074	0.066	0.057	0.123	0.12	**1.02**
	Vanadium	28.6	J	1	4.576	4.118	3.518	7.636	11.40	0.67
	Zinc	21.8	J	Regression	54.427	48.984	2.681	51.665	14.50	**3.56**
	Cyanide	2	U	1	0.160	0.144	0.123	0.267	NA	NA
RG-15	Aluminum	3500		1	560.000	504.000	430.500	934.500	109.70	**8.52**
	Antimony	0.46	U	1	0.037	0.033	0.028	0.061	NA	NA
	Arsenic	0.3	U	Regression	0.004	0.004	0.018	0.022	5.10	0.00
	Barium	23.1	B	1	3.696	3.326	2.841	6.168	20.80	0.30
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.02	U	Regression	0.212	0.191	0.001	0.192	1.45	0.13
	Calcium	800000		1	128000.000	115200.000	98400.000	213600.000	NA	NA
	Chromium	4.7		Regression	1.401	1.261	0.578	1.839	1.00	**1.84**
	Cobalt	2.2	BJ	1	0.352	0.317	0.271	0.587	NA	NA
	Copper	11.8	J	Regression	1.767	1.590	1.451	3.041	47.00	0.06
	Iron	4330		1	692.800	623.520	532.590	1156.110	NA	NA
	Lead	1.6	J	6.33	1.620	1.458	0.197	1.655	3.85	0.43
	Magnesium	1600		1	256.000	230.400	196.800	427.200	NA	NA
	Manganese	173	J	0.07	1.938	1.744	21.279	23.023	977.00	0.02

3042232

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
RG-15	Mercury	0.11	J	Regression	0.082	0.074	0.014	0.088	0.45	0.19
	Nickel	1.3	B	0.92	0.191	0.172	0.160	0.332	77.40	0.00
	Potassium	665	B	1	106.400	95.760	81.795	177.555	NA	NA
	Selenium	0.57	U	1	0.046	0.041	0.035	0.076	0.40	0.19
	Silver	0.14	U	1	0.011	0.010	0.009	0.019	NA	NA
	Sodium	255	B	1	40.800	36.720	31.365	68.085	NA	NA
	Thallium	0.51	U	1	0.041	0.037	0.031	0.068	0.12	0.57
	Vanadium	15		1	2.400	2.160	1.845	4.005	11.40	0.35
	Zinc	13.6	J	Regression	48.661	43.795	1.673	45.468	14.50	**3.14**
	Cyanide	1.1	U	1	0.088	0.079	0.068	0.147	NA	NA
RG-16	Aluminum	5200		1	832.000	748.800	639.600	1388.400	109.70	**12.66**
	Antimony	0.53	U	1	0.042	0.038	0.033	0.071	NA	NA
	Arsenic	0.34	U	Regression	0.005	0.004	0.021	0.025	5.10	0.00
	Barium	21.6	B	1	3.456	3.110	2.657	5.767	20.80	0.28
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.08	B	Regression	0.668	0.601	0.010	0.611	1.45	0.42
	Calcium	46400		1	7424.000	6681.600	5707.200	12388.800	NA	NA
	Chromium	5.9		Regression	1.355	1.220	0.726	1.945	1.00	**1.95**
	Cobalt	3.1	BJ	1	0.496	0.446	0.381	0.828	NA	NA
	Copper	19.9	J	Regression	2.004	1.804	2.448	4.252	47.00	0.09
	Iron	5780		1	924.800	832.320	710.940	1543.260	NA	NA
	Lead	2.2	J	6.33	2.228	2.005	0.271	2.276	3.85	0.59
	Magnesium	1660		1	265.600	239.040	204.180	443.220	NA	NA
	Manganese	196	J	0.07	2.195	1.976	24.108	26.084	977.00	0.03
	Mercury	0.12	U	Regression	0.067	0.060	0.007	0.068	0.45	0.15
	Nickel	4.2	B	0.92	0.618	0.556	0.517	1.073	77.40	0.01
	Potassium	803	B	1	128.480	115.632	98.769	214.401	NA	NA
	Selenium	0.66	U	1	0.053	0.048	0.041	0.088	0.40	0.22
	Silver	0.16	U	1	0.013	0.012	0.010	0.021	NA	NA
	Sodium	492	B	1	78.720	70.848	60.516	131.364	NA	NA
	Thallium	0.58	U	1	0.046	0.042	0.036	0.077	0.12	0.65
	Vanadium	17		1	2.720	2.448	2.091	4.539	11.40	0.40
	Zinc	25.9	J	Regression	56.699	51.029	3.186	54.214	14.50	**3.74**
	Cyanide	1.3	U	1	0.104	0.094	0.080	0.174	NA	NA
95% UCL on mean in River Gut	Aluminum	12778.90		1	2044.623	1840.161	1571.804	3411.965	109.70	**31.10**
	Antimony	0.28		1	0.045	0.041	0.035	0.075	NA	NA
	Arsenic	0.95		Regression	0.027	0.024	0.117	0.141	5.10	0.03
	Barium	68.16		1	10.906	9.815	8.384	18.199	20.80	0.87
	Beryllium	0.01		1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.28		Regression	1.339	1.205	0.035	1.240	1.45	0.85
	Calcium	179734.49		1	28757.518	25881.766	22107.342	47989.108	NA	NA
	Chromium	18.37		Regression	1.148	1.033	2.260	3.293	1.00	**3.29**
	Cobalt	11.53		1	1.845	1.660	1.418	3.079	NA	NA
	Copper	35.64		Regression	2.307	2.076	4.383	6.459	47.00	0.14
	Iron	22110.85		1	3537.737	3183.963	2719.635	5903.598	NA	NA
	Lead	11.25		6.33	11.399	10.259	1.384	11.643	3.85	**3.02**
	Magnesium	6717.89		1	1074.862	967.376	826.300	1793.676	NA	NA

304233

Table C-10: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
95% UCL on mean in River Gut	Manganese	573.08		0.07	6.418	5.777	70.489	76.265	977.00	0.08
	Mercury	0.21		Regression	0.102	0.092	0.026	0.118	0.45	0.26
	Nickel	10.56		0.92	1.555	1.400	1.299	2.699	77.40	0.03
	Potassium	2079.02		1	332.644	299.380	255.720	555.100	NA	NA
	Selenium	0.73		1	0.117	0.106	0.090	0.196	0.40	0.49
	Silver	0.09		1	0.014	0.012	0.010	0.023	NA	NA
	Sodium	560.48		1	89.677	80.709	68.939	149.648	NA	NA
	Thallium	0.31		1	0.050	0.045	0.038	0.083	0.12	0.69
	Vanadium	60.16		1	9.625	8.663	7.399	16.062	11.40	**1.41**
	Zinc	105.62		Regression	79.146	71.231	12.991	84.222	14.50	**5.81**
	Cyanide	0.69		1	0.111	0.100	0.085	0.185	NA	NA

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Sample et al., 1996)

[b] Soil-Worm Uptake Factors (UF): lead, manganese and nickel factor is mean UF (Sample et al., 1997).

Regression Models used for arsenic, cadmium, chromium, mercury, and zinc (Sample et al., 1997):

arsenic: ln(worm)=-1.747+0.9884(ln[soil]); cadmium: ln(worm)=2.8216+0.5512(ln[soil]); chromium: ln(worm)=2.3957+-0.146(ln[soil])

mercury: ln(worm)=0.0781+0.3369(ln[soil]); and zinc: ln(worm)=5.0981+0.2373(ln[soil]).

Soil invertebrates (e.g., earthworms) were assumed to contain 84% moisture content (USEPA, 1993).

U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit was used for exposure calculation.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated due to lack of benchmark.

NA: No benchmark available

Average soil moisture (18%) measured in the River Gut was used to calculate wet weight soil concentration for exposure from ingestion of soil.

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Table C-11: *Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks*
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm ptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
BG-1	Aluminum	15400		1	2464.000	2217.600	1894.200	4111.800	109.70	**37.48**
	Antimony	0.61	U	1	0.049	0.044	0.038	0.081	NA	NA
	Arsenic	0.39	U	Regression	0.006	0.005	0.024	0.029	5.10	0.01
	Barium	101		1	16.160	14.544	12.423	26.967	20.80	**1.30**
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.16	B	Regression	0.979	0.881	0.020	0.901	1.45	0.62
	Calcium	39800		1	6368.000	5731.200	4895.400	10626.600	NA	NA
	Chromium	19.7		Regression	1.136	1.023	2.423	3.446	1.00	**3.45**
	Cobalt	11.4	BJ	1	1.824	1.642	1.402	3.044	NA	NA
	Copper	49.3	J	Regression	2.495	2.245	6.064	8.309	47.00	0.18
	Iron	20400		1	3264.000	2937.600	2509.200	5446.800	NA	NA
	Lead	12.9	J	6.33	13.065	11.759	1.587	13.345	3.85	**3.47**
	Magnesium	5380		1	860.800	774.720	661.740	1436.460	NA	NA
	Manganese	534	J	0.07	5.981	5.383	65.682	71.065	977.00	0.07
	Mercury	0.14	U	Regression	0.071	0.064	0.009	0.072	0.45	0.16
	Nickel	11.7	B	0.92	1.722	1.550	1.439	2.989	77.40	0.04
	Potassium	3310	J	1	529.600	476.640	407.130	883.770	NA	NA
	Selenium	0.76	U	1	0.061	0.055	0.047	0.101	0.40	0.25
	Silver	0.18	U	1	0.014	0.013	0.011	0.024	NA	NA
	Sodium	660	B	1	105.600	95.040	81.180	176.220	NA	NA
	Thallium	0.67	U	1	0.054	0.048	0.041	0.089	0.12	0.75
	Vanadium	68.2		1	10.912	9.821	8.389	18.209	11.40	**1.60**
	Zinc	58.7	J	Regression	68.849	61.964	7.220	69.184	14.50	**4.77**
	Cyanide	1.5	U	1	0.120	0.108	0.092	0.200	NA	NA
BG-2	Aluminum	3990		1	638.400	574.560	490.770	1065.330	109.70	**9.71**
	Antimony	0.43	U	1	0.034	0.031	0.026	0.057	NA	NA
	Arsenic	0.43	BJ	Regression	0.012	0.011	0.053	0.064	5.10	0.01
	Barium	63		1	10.080	9.072	7.749	16.821	20.80	0.81
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.02	U	Regression	0.212	0.191	0.001	0.192	1.45	0.13
	Calcium	19800		1	3168.000	2851.200	2435.400	5286.600	NA	NA

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Table C-11: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm ptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
BG-2	Chromium	4.6		Regression	1.405	1.265	0.566	1.831	1.00	**1.83**
	Cobalt	5.4	BJ	1	0.864	0.778	0.664	1.442	NA	NA
	Copper	11.2	J	Regression	1.745	1.570	1.378	2.948	47.00	0.06
	Iron	5300		1	848.000	763.200	651.900	1415.100	NA	NA
	Lead	2.4	J	6.33	2.431	2.188	0.295	2.483	3.85	0.64
	Magnesium	1150		1	184.000	165.600	141.450	307.050	NA	NA
	Manganese	339	J	0.07	3.797	3.417	41.697	45.114	977.00	0.05
	Mercury	0.1	U	Regression	0.063	0.057	0.006	0.063	0.45	0.14
	Nickel	3.2	B	0.92	0.471	0.424	0.394	0.818	77.40	0.01
	Potassium	582	B	1	93.120	83.808	71.586	155.394	NA	NA
	Selenium	0.53	U	1	0.042	0.038	0.033	0.071	0.40	0.18
	Silver	0.13	U	1	0.010	0.009	0.008	0.017	NA	NA
	Sodium	423	B	1	67.680	60.912	52.029	112.941	NA	NA
	Thallium	0.47	U	1	0.038	0.034	0.029	0.063	0.12	0.52
	Vanadium	29.9		1	4.784	4.306	3.678	7.983	11.40	0.70
	Zinc	13.1	J	Regression	48.231	43.408	1.611	45.019	14.50	**3.10**
	Cyanide	1.1	U	1	0.088	0.079	0.068	0.147	NA	NA
Average in Bethlehem Gut	Aluminum	9695		1	1551.200	1396.080	1192.485	2588.565	109.70	**23.60**
	Antimony	0.26		1	0.042	0.037	0.032	0.069	NA	NA
	Arsenic	0.3125		Regression	0.009	0.008	0.038	0.046	5.10	0.01
	Barium	82		1	13.120	11.808	10.086	21.894	20.80	**1.05**
	Beryllium	0.0125		1	0.002	0.002	0.002	0.003	NA	NA
	Cadmium	0.085		Regression	0.691	0.622	0.010	0.632	1.45	0.44
	Calcium	29800		1	4768.000	4291.200	3665.400	7956.600	NA	NA
	Chromium	12.15		Regression	1.220	1.098	1.494	2.592	1.00	**2.59**
	Cobalt	8.4		1	1.344	1.210	1.033	2.243	NA	NA
	Copper	30.25		Regression	2.217	1.996	3.721	5.716	47.00	0.12
	Iron	12850		1	2056.000	1850.400	1580.550	3430.950	NA	NA
	Lead	7.65		6.33	7.748	6.973	0.941	7.914	3.85	**2.06**
	Magnesium	3265		1	522.400	470.160	401.595	871.755	NA	NA
	Manganese	436.5		0.07	4.889	4.400	53.690	58.089	977.00	0.06

Table C-11: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm ptake Factor	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
Average in Bethlehem Gut	Mercury	0.06		Regression	0.067	0.060	0.007	0.068	0.45	0.15
	Nickel	7.45		0.92	1.097	0.987	0.916	1.903	77.40	0.02
	Potassium	1946		1	311.360	280.224	239.358	519.582	NA	NA
	Selenium	0.3225		1	0.052	0.046	0.040	0.086	0.40	0.22
	Silver	0.0775		1	0.012	0.011	0.010	0.021	NA	NA
	Sodium	541.5		1	86.640	77.976	66.605	144.581	NA	NA
	Thallium	0.285		1	0.046	0.041	0.035	0.076	0.12	0.63
	Vanadium	49.05		1	7.848	7.063	6.033	13.096	11.40	**1.15**
	Zinc	35.9		Regression	61.266	55.140	4.416	59.555	14.50	**4.11**
	Cyanide	0.65		1	0.104	0.094	0.080	0.174	NA	NA

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Sample et al., 1996)

* Soil-Worm Uptake Factors (UF): lead, manganese and nickel factor is mean UF (Sample et al., 1997).

Regression Models used for arsenic, cadmium, chromium, mercury, and zinc (Sample et al., 1997):
arsenic: ln(worm)=-1.747+0.9884(ln[soil]); cadmium: ln(worm)=2.8216+0.5512(ln[soil]); chromium: ln(worm)=2.3957+-0.146(ln[soil])
mercury: ln(worm)=0.0781+0.3369(ln[soil]); and zinc: ln(worm)=5.0981+0.2373(ln[soil]).

Soil invertebrates (e.g., earthworms) were assumed to contain 84% moisture content (USEPA, 1993).

U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit was used for exposure calculation.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated due to lack of benchmark.

NA: No benchmark available

-- = Hazard Quotient not calculated due to lack of benchmark.

NA: No benchmark available

Average soil moisture (20%) measured in the Bethlehem Gut was used to calculate wet weight soil concentration for exposure from ingestion of soil.

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Tabel C-12: Estimated Chemical Exposure for the Spotted ... per Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor*	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
FPG-1	Aluminum	10200		1	1632.000	1468.800	1147.500	2616.300	109.70	**23.85**
	Antimony	0.52	U	1	0.042	0.037	0.029	0.067	NA	NA
	Arsenic	1.4	BJ	Regression	0.039	0.035	0.158	0.193	5.10	0.04
	Barium	67.4		1	10.784	9.706	7.583	17.288	20.80	0.83
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.09	B	Regression	0.713	0.642	0.010	0.652	1.45	0.45
	Calcium	36600		1	5856.000	5270.400	4117.500	9387.900	NA	NA
	Chromium	13.9		Regression	1.196	1.076	1.564	2.640	1.00	**2.64**
	Cobalt	8.2	BJ	1	1.312	1.181	0.923	2.103	NA	NA
	Copper	33.1	J	Regression	2.266	2.040	3.724	5.763	47.00	0.12
	Iron	14300		1	2288.000	2059.200	1608.750	3667.950	NA	NA
	Lead	8.8	J	6.33	8.913	8.021	0.990	9.011	3.85	**2.34**
	Magnesium	3680		1	588.800	529.920	414.000	943.920	NA	NA
	Manganese	267	J	0.07	2.990	2.691	30.038	32.729	977.00	0.03
	Mercury	0.13	U	Regression	0.069	0.062	0.007	0.069	0.45	0.15
	Nickel	7.7	B	0.92	1.133	1.020	0.866	1.886	77.40	0.02
	Potassium	2150	J	1	344.000	309.600	241.875	551.475	NA	NA
	Selenium	1.1	B	1	0.176	0.158	0.124	0.282	0.40	0.71
	Silver	0.16	U	1	0.013	0.012	0.009	0.021	NA	NA
	Sodium	570	B	1	91.200	82.080	64.125	146.205	NA	NA
	Thallium	0.57	U	1	0.046	0.041	0.032	0.073	0.12	0.61
	Vanadium	54.6		1	8.736	7.862	6.143	14.005	11.40	**1.23**
	Zinc	39.4	J	Regression	62.634	56.370	4.433	60.803	14.50	**4.19**
	Cyanide	1.3	U	1	0.104	0.094	0.073	0.167	NA	NA
FPG-2	Aluminum	9750		1	1560.000	1404.000	1096.875	2500.875	109.70	**22.80**
	Antimony	0.51	U	1	0.041	0.037	0.029	0.065	NA	NA
	Arsenic	2.8	J	Regression	0.077	0.069	0.315	0.384	5.10	0.08
	Barium	70		1	11.200	10.080	7.875	17.955	20.80	0.86
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.2	B	Regression	1.107	0.997	0.023	1.019	1.45	0.70
	Calcium	25300		1	4048.000	3643.200	2846.250	6489.450	NA	NA
	Chromium	13.9		Regression	1.196	1.076	1.564	2.640	1.00	**2.64**
	Cobalt	8.6	BJ	1	1.376	1.238	0.968	2.206	NA	NA
	Copper	33.2	J	Regression	2.268	2.041	3.735	5.776	47.00	0.12
	Iron	14800		1	2368.000	2131.200	1665.000	3796.200	NA	NA
	Lead	5.7	J	6.33	5.773	5.196	0.641	5.837	3.85	**1.52**
	Magnesium	3670		1	587.200	528.480	412.875	941.355	NA	NA
	Manganese	332	J	0.07	3.718	3.347	37.350	40.697	977.00	0.04
	Mercury	0.12	U	Regression	0.067	0.060	0.007	0.067	0.45	0.15
	Nickel	6.9	B	0.92	1.016	0.914	0.776	1.690	77.40	0.02
	Potassium	1940	J	1	310.400	279.360	218.250	497.610	NA	NA
	Selenium	0.63	U	1	0.050	0.045	0.035	0.081	0.40	0.20
	Silver	0.15	U	1	0.012	0.011	0.008	0.019	NA	NA
	Sodium	887	B	1	141.920	127.728	99.788	227.516	NA	NA
	Thallium	0.56	U	1	0.045	0.040	0.032	0.072	0.12	0.60
	Vanadium	56.5		1	9.040	8.136	6.356	14.492	11.40	**1.27**

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Tabel C-12: Estimated Chemical Exposure for the Spotte[illegible]iper Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor*	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
FPG-2	Zinc	34.2	J	Regression	60.565	54.508	3.848	58.356	14.50	**4.02**
	Cyanide	1.2	U	1	0.096	0.086	0.068	0.154	NA	NA
FPG-3	Aluminum	9150		1	1464.000	1317.600	1029.375	2346.975	109.70	**21.39**
	Antimony	0.62	U	1	0.050	0.045	0.035	0.080	NA	NA
	Arsenic	1.3	BJ	Regression	0.000	0.000	0.146	0.146	5.10	0.03
	Barium	61.4	B	1	9.824	8.842	6.908	15.749	20.80	0.76
	Beryllium	0.03	U	1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.05	B	Regression	0.000	0.000	0.006	0.006	1.45	0.00
	Calcium	17900		1	2864.000	2577.600	2013.750	4591.350	NA	NA
	Chromium	13.7		Regression	0.000	0.000	1.541	1.541	1.00	**1.54**
	Cobalt	9.3	BJ	1	1.488	1.339	1.046	2.385	NA	NA
	Copper	25.8	J	Regression	0.000	0.000	2.903	2.903	47.00	0.06
	Iron	15200		1	2432.000	2188.800	1710.000	3898.800	NA	NA
	Lead	5.6	J	6.33	5.672	5.105	0.630	5.735	3.85	**1.49**
	Magnesium	4210		1	673.600	606.240	473.625	1079.865	NA	NA
	Manganese	197	J	0.07	2.206	1.986	22.163	24.148	977.00	0.02
	Mercury	0.15	U	Regression	0.000	0.000	0.008	0.008	0.45	0.02
	Nickel	7	B	0.92	1.030	0.927	0.788	1.715	77.40	0.02
	Potassium	2720	J	1	435.200	391.680	306.000	697.680	NA	NA
	Selenium	1.2	B	1	0.192	0.173	0.135	0.308	0.40	0.77
	Silver	0.18	U	1	0.014	0.013	0.010	0.023	NA	NA
	Sodium	21100	B	1	3376.000	3038.400	2373.750	5412.150	NA	NA
	Thallium	0.68	U	1	0.054	0.049	0.038	0.087	0.12	0.73
	Vanadium	69.4		1	11.104	9.994	7.808	17.801	11.40	**1.56**
	Zinc	29.3	J	Regression	0.000	0.000	3.296	3.296	14.50	0.23
	Cyanide	1.5	U	1	0.120	0.108	0.084	0.192	NA	NA
FPG-4	Aluminum	2770		1	443.200	398.880	311.625	710.505	109.70	**6.48**
	Antimony	0.49	U	1	0.039	0.035	0.028	0.063	NA	NA
	Arsenic	1.7	B	Regression	0.000	0.000	0.191	0.191	5.10	0.04
	Barium	8.7	B	1	1.392	1.253	0.979	2.232	20.80	0.11
	Beryllium	0.02	U	1	0.002	0.001	0.001	0.003	NA	NA
	Cadmium	0.02	U	Regression	0.000	0.000	0.001	0.001	1.45	0.00
	Calcium	21300		1	3408.000	3067.200	2396.250	5463.450	NA	NA
	Chromium	3		Regression	0.000	0.000	0.338	0.338	1.00	0.34
	Cobalt	3	BJ	1	0.480	0.432	0.338	0.770	NA	NA
	Copper	6	B	Regression	0.000	0.000	0.675	0.675	47.00	0.01
	Iron	4320		1	691.200	622.080	486.000	1108.080	NA	NA
	Lead	2.6	J	6.33	2.633	2.370	0.293	2.662	3.85	0.69
	Magnesium	1850		1	296.000	266.400	208.125	474.525	NA	NA
	Manganese	64.6	J	0.07	0.724	0.651	7.268	7.919	977.00	0.01
	Mercury	0.12	U	Regression	0.000	0.000	0.007	0.007	0.45	0.02
	Nickel	1.5	B	0.92	0.221	0.199	0.169	0.367	77.40	0.00
	Potassium	493	B	1	78.880	70.992	55.463	126.455	NA	NA
	Selenium	0.62	U	1	0.050	0.045	0.035	0.080	0.40	0.20
	Silver	0.15	U	1	0.012	0.011	0.008	0.019	NA	NA
	Sodium	1110	B	1	177.600	159.840	124.875	284.715	NA	NA

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Tabel C-12: Estimated Chemical Exposure for the Spotted Sandpiper Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Soil Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor*	Worm Concentration (mg/kg)	Exposure Estimate (mg/kg/d)			NOAEL Benchmark	NOAEL HQ
						Food	Soil	Total		
FPG-4	Thallium	0.54	U	1	0.043	0.039	0.030	0.069	0.12	0.58
	Vanadium	16.6		1	2.656	2.390	1.868	4.258	11.40	0.37
	Zinc	12.2	J	Regression	0.000	0.000	1.373	1.373	14.50	0.09
	Cyanide	1.2	U	1	0.096	0.086	0.068	0.154	NA	NA
Average in Fair Plain Gut	Aluminum	7967.5		1	1274.800	1147.320	896.344	2043.664	109.70	**18.63**
	Antimony	0.2675		1	0.043	0.039	0.030	0.069	NA	NA
	Arsenic	1.8		Regression	0.050	0.045	0.203	0.247	5.10	0.05
	Barium	51.875		1	8.300	7.470	5.836	13.306	20.80	0.64
	Beryllium	0.01375		1	0.002	0.002	0.002	0.004	NA	NA
	Cadmium	0.0875		Regression	0.702	0.632	0.010	0.642	1.45	0.44
	Calcium	25275		1	4044.000	3639.600	2843.438	6483.038	NA	NA
	Chromium	11.125		Regression	1.235	1.112	1.252	2.363	1.00	**2.36**
	Cobalt	7.275		1	1.164	1.048	0.818	1.866	NA	NA
	Copper	24.525		Regression	2.108	1.897	2.759	4.656	47.00	0.10
	Iron	12155		1	1944.800	1750.320	1367.438	3117.758	NA	NA
	Lead	5.675		6.33	5.748	5.173	0.638	5.811	3.85	**1.51**
	Magnesium	3352.5		1	536.400	482.760	377.156	859.916	NA	NA
	Manganese	215.15		0.07	2.410	2.169	24.204	26.373	977.00	0.03
	Mercury	0.065		Regression	0.069	0.062	0.007	0.069	0.45	0.15
	Nickel	5.775		0.92	0.850	0.765	0.650	1.415	77.40	0.02
	Potassium	1825.75		1	292.120	262.908	205.397	468.305	NA	NA
	Selenium	0.73125		1	0.117	0.105	0.082	0.188	0.40	0.47
	Silver	0.08		1	0.013	0.012	0.009	0.021	NA	NA
	Sodium	5916.75		1	946.680	852.012	665.634	1517.646	NA	NA
	Thallium	0.29375		1	0.047	0.042	0.033	0.075	0.12	0.63
	Vanadium	49.275		1	7.884	7.096	5.543	12.639	11.40	**1.11**
	Zinc	28.775		Regression	58.133	52.319	3.237	55.557	14.50	**3.83**
	Cyanide	0.65		1	0.104	0.094	0.073	0.167	NA	NA

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Sample et al., 1996)

* Soil-Worm Uptake Factors (UF): lead, manganese and nickel factor is mean UF (Sample et al., 1997).
Regression Models used for arsenic, cadmium, chromium, mercury, and zinc (Sample et al., 1997):
arsenic: ln(worm)=-1.747+0.9884(ln[soil]); cadmium: ln(worm)=2.8216+0.5512(ln[soil]); chromium: ln(worm)=2.3957+-0.146(ln[soil])
mercury: ln(worm)=0.0781+0.3369(ln[soil]); and zinc: ln(worm)=5.0981+0.2373(ln[soil]).

Soil invertebrates (e.g., earthworms) were assumed to contain 84% moisture content (USEPA, 1993).

U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit was used for exposure calculation.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

-- = Hazard Quotient not calculated due to lack of benchmark.

NA: No benchmark available

Average soil moisture (25%) measured in the Fair Plain Gut was used to calculate wet weight soil concentration for exposure from ingestion of soil.

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Table C-13: Estimated Chemical Exposure for the Great Blue Heron Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor*	Fish Concentration (mg/kg)	Exposure Estimat (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
FPG-3	Aluminum	9150		1	2287.500	397.826	109.70	**3.63**
	Antimony	0.62	U	1	0.078	0.013	NA	NA
	Arsenic	1.3	BJ	Regression	0.056	0.010	5.10	0.00
	Barium	61.4	B	1	15.350	2.670	20.80	0.13
	Beryllium	0.03	U	1	0.004	0.001	NA	NA
	Cadmium	0.05	B	Regression	0.806	0.140	1.45	0.10
	Calcium	17900		1	4475.000	778.261	NA	NA
	Chromium	13.7		Regression	1.872	0.326	1.00	0.33
	Cobalt	9.3	BJ	1	2.325	0.404	NA	NA
	Copper	25.8	J	Regression	3.334	0.580	47.00	0.01
	Iron	15200		1	3800.000	660.870	NA	NA
	Lead	5.6	J	6.33	8.862	1.541	3.85	0.40
	Magnesium	4210		1	1052.500	183.043	NA	NA
	Manganese	197	J	0.07	3.448	0.600	977.00	0.00
	Mercury	0.15	U	Regression	0.113	0.020	0.45	0.04
	Nickel	7	B	0.92	1.610	0.280	77.40	0.00
	Potassium	2720	J	1	680.000	118.261	NA	NA
	Selenium	1.2	B	1	0.300	0.052	0.40	0.13
	Silver	0.18	U	1	0.023	0.004	NA	NA
	Sodium	21100	B	1	5275.000	917.391	NA	NA
	Thallium	0.68	U	1	0.085	0.015	0.12	0.12
	Vanadium	69.4		1	17.350	3.017	11.40	0.26
	Zinc	29.3	J	Regression	91.223	15.865	14.50	**1.09**
	Cyanide	1.5	U	1	0.188	0.033	NA	NA

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Table C-13: Estimated Chemical Exposure for the Great Blue Heron Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor*	Fish Concentration (mg/kg)	Exposure Estimat (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
FPG-4	Aluminum	2770		1	692.500	120.435	109.70	**1.10**
	Antimony	0.49	U	1	0.061	0.011	NA	NA
	Arsenic	1.7	B	Regression	0.074	0.013	5.10	0.00
	Barium	8.7	B	1	2.175	0.378	20.80	0.02
	Beryllium	0.02	U	1	0.003	0.000	NA	NA
	Cadmium	0.02	U	Regression	0.332	0.058	1.45	0.04
	Calcium	21300		1	5325.000	926.087	NA	NA
	Chromium	3		Regression	2.337	0.406	1.00	0.41
	Cobalt	3	BJ	1	0.750	0.130	NA	NA
	Copper	6	B	Regression	2.345	0.408	47.00	0.01
	Iron	4320		1	1080.000	187.826	NA	NA
	Lead	2.6	J	6.33	4.115	0.716	3.85	0.19
	Magnesium	1850		1	462.500	80.435	NA	NA
	Manganese	64.6	J	0.07	1.131	0.197	977.00	0.00
	Mercury	0.12	U	Regression	0.105	0.018	0.45	0.04
	Nickel	1.5	B	0.92	0.345	0.060	77.40	0.00
	Potassium	493	B	1	123.250	21.435	NA	NA
	Selenium	0.62	U	1	0.078	0.013	0.40	0.03
	Silver	0.15	U	1	0.019	0.003	NA	NA
	Sodium	1110	B	1	277.500	48.261	NA	NA
	Thallium	0.54	U	1	0.068	0.012	0.12	0.10
	Vanadium	16.6		1	4.150	0.722	11.40	0.06
	Zinc	12.2	J	Regression	74.099	12.887	14.50	0.89
	Cyanide	1.2	U	1	0.150	0.026	NA	NA

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Table C-13: Estimated Chemical Exposure for the Great Blue Heron Compared to Ecotoxicological Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Soil-Worm Uptake Factor*	Fish Concentration (mg/kg)	Exposure Estimat (mg/kg/d)	NOAEL Benchmark	NOAEL HQ
Average of sediment samples	Aluminum	5960		1	1490.000	259.130	109.70	**2.36**
	Antimony	0.2775		1	0.069	0.012	NA	NA
	Arsenic	1.5		Regression	0.065	0.011	5.10	0.00
	Barium	35.05		1	8.763	1.524	20.80	0.07
	Beryllium	0.0125		1	0.003	0.001	NA	NA
	Cadmium	0.03		Regression	0.608	0.106	1.45	0.07
	Calcium	19600		1	4900.000	852.174	NA	NA
	Chromium	8.35		Regression	2.013	0.350	1.00	0.35
	Cobalt	6.15		1	1.538	0.267	NA	NA
	Copper	15.9		Regression	2.967	0.516	47.00	0.01
	Iron	9760		1	2440.000	424.348	NA	NA
	Lead	4.1		6.33	6.488	1.128	3.85	0.29
	Magnesium	3030		1	757.500	131.739	NA	NA
	Manganese	130.8		0.07	2.289	0.398	977.00	0.00
	Mercury	0.0675		Regression	0.109	0.019	0.45	0.04
	Nickel	4.25		0.92	0.978	0.170	77.40	0.00
	Potassium	1606.5		1	401.625	69.848	NA	NA
	Selenium	0.755		1	0.189	0.033	0.40	0.08
	Silver	0.0825		1	0.021	0.004	NA	NA
	Sodium	11105		1	2776.250	482.826	NA	NA
	Thallium	0.305		1	0.076	0.013	0.12	0.11
	Vanadium	43		1	10.750	1.870	11.40	0.16
	Zinc	20.75		Regression	84.051	14.618	14.50	**1.01**
	Cyanide	0.675		1	0.169	0.029	NA	NA

[a] NOAELs: No Observed Adverse Effects Levels (mg/kg/d) (Sample et al., 1996)

* Soil-Worm Uptake Factors (UF): lead, manganese and nickel factor is mean UF (Sample et al., 1997).
Regression Models used for arsenic, cadmium, chromium, mercury, and zinc (Sample et al., 1997):
arsenic: ln(worm)=-1.747+0.9884(ln[soil]); cadmium: ln(worm)=2.8216+0.5512(ln[soil]); chromium: ln(worm)=2.3957+-0.146(ln[soil])
mercury: ln(worm)=0.0781+0.3369(ln[soil]); and zinc: ln(worm)=5.0981+0.2373(ln[soil]).

Fish were assumed to contain 75% moisture content (USEPA, 1993).
U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit was used for exposure calculation.
B = Result is between the instrument detection limit and the contract required detection limit.
J = Estimated value.
Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.
-- = Hazard Quotient not calculated due to lack of benchmark.
NA: No benchmark available

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Table C-14: Chemicals of Potential Ecological Concern (COPEC) for each Receptor
Comparison with Lowest Observed Adverse Effects Levels (LOAELs)
Drainage Channels - Virgin Island Chemical Site

Location	Analyte	Total Exposure	NOAEL Benchmark	NOAEL HQ	LOAEL Benchmark	LOAEL HQ
Goats						
RG-2	Aluminum	60.450	0.33	182.40	3.31	**18.26**
	Vanadium	0.270	0.07	4.06	0.67	0.40
RG-2D	Aluminum	69.031	0.33	208.29	3.31	**20.86**
	Vanadium	0.316	0.07	4.75	0.67	0.47
RG-3	Aluminum	58.110	0.33	175.34	3.31	**17.56**
	Vanadium	0.233	0.07	3.49	0.67	0.35
RG-4	Aluminum	56.160	0.33	169.45	3.31	**16.97**
	Vanadium	0.192	0.07	2.88	0.67	0.29
RG-4D	Aluminum	35.919	0.33	108.38	3.31	**10.85**
	Vanadium	0.128	0.07	1.92	0.67	0.19
RG-5	Aluminum	43.680	0.33	131.80	3.31	**13.20**
	Vanadium	0.188	0.07	2.82	0.67	0.28
RG-6	Aluminum	40.950	0.33	123.56	3.31	**12.37**
	Vanadium	0.201	0.07	3.01	0.67	0.30
RG-7	Aluminum	44.850	0.33	135.33	3.31	**13.55**
	Vanadium	0.249	0.07	3.74	0.67	0.37
RG-8	Aluminum	39.780	0.33	120.03	3.31	**12.02**
	Vanadium	0.175	0.07	2.63	0.67	0.26
RG-9	Aluminum	60.060	0.33	181.22	3.31	**18.15**
	Vanadium	0.336	0.07	5.04	0.67	0.50
RG-10	Aluminum	37.050	0.33	111.79	3.31	**11.19**
	Vanadium	0.181	0.07	2.71	0.67	0.27
RG-11	Aluminum	29.952	0.33	90.37	3.31	**9.05**
	Vanadium	0.174	0.07	2.61	0.67	0.26
RG-12	Aluminum	24.219	0.33	73.08	3.31	**7.32**
	Vanadium	0.207	0.07	3.11	0.67	0.31
RG-13	Aluminum	56.160	0.33	169.45	3.31	**16.97**
	Vanadium	0.274	0.07	4.12	0.67	0.41
RG-14	Aluminum	28.158	0.33	84.96	3.31	**8.51**
	Vanadium	0.112	0.07	1.68	0.67	0.17
RG-15	Aluminum	13.650	0.33	41.19	3.31	**4.12**
RG-16	Aluminum	20.280	0.33	61.19	3.31	**6.13**
	Vanadium	0.066	0.07	1.00	0.67	0.10
95% UCL River Gut	Aluminum	49.838	0.33	150.38	3.31	**15.06**
	Vanadium	0.235	0.07	3.53	0.67	0.35
BG-1	Aluminum	58.603	0.33	176.82	3.31	**17.70**
	Vanadium	0.260	0.07	3.90	0.67	0.39
BG-2	Aluminum	15.183	0.33	45.81	3.31	**4.59**
	Vanadium	0.114	0.07	1.71	0.67	0.17
Average Beth. Gut	Aluminum	36.893	0.33	111.32	3.31	**11.15**
	Vanadium	0.187	0.07	2.81	0.67	0.28

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Table C-14: Chemicals of Potential Ecological Concern (COPEC) for each Receptor
Comparison with Lowest Observed Adverse Effects Levels (LOAELs)
Drainage Channels - Virgin Island Chemical Site

Location	Analyte	Total Exposure	NOAEL Benchmark	NOAEL HQ	LOAEL Benchmark	LOAEL HQ
FPG-1	Aluminum	36.401	0.33	109.83	3.31	**11.00**
	Vanadium	0.195	0.07	2.93	0.67	0.29
FPG-2	Aluminum	34.795	0.33	104.99	3.31	**10.51**
	Vanadium	0.202	0.07	3.03	0.67	0.30
Average FPG	Aluminum	35.598	0.33	107.41	3.31	**10.75**
	Vanadium	0.199	0.07	2.98	0.67	0.30
Jamaican Fruit Bats						
RG-2	Aluminum	11.41	1.70	6.72	16.99	0.67
RG-2D	Aluminum	13.03	1.70	7.67	16.99	0.77
RG-3	Aluminum	10.97	1.70	6.46	16.99	0.65
RG-4	Aluminum	10.60	1.70	6.24	16.99	0.62
RG-4D	Aluminum	6.78	1.70	3.99	16.99	0.40
RG-5	Aluminum	8.24	1.70	4.85	16.99	0.48
RG-6	Aluminum	7.73	1.70	4.55	16.99	0.45
RG-7	Aluminum	8.46	1.70	4.98	16.99	0.50
RG-8	Aluminum	7.51	1.70	4.42	16.99	0.44
RG-9	Aluminum	11.33	1.70	6.67	16.99	0.67
RG-10	Aluminum	6.99	1.70	4.12	16.99	0.41
	Selenium	0.34	0.33	1.06	0.54	0.63
RG-11	Aluminum	5.65	1.70	3.33	16.99	0.33
RG-12	Aluminum	4.57	1.70	2.69	16.99	0.27
RG-13	Aluminum	10.60	1.70	6.24	16.99	0.62
	Selenium	0.53	0.33	1.62	0.54	0.98
RG-14	Aluminum	5.31	1.70	3.13	16.99	0.31
RG-15	Aluminum	2.58	1.70	1.52	16.99	0.15
RG-16	Aluminum	3.83	1.70	2.25	16.99	0.23
95% UCL River Gut	Aluminum	9.41	1.70	5.54	16.99	0.55
BG-1	Aluminum	11.33	1.70	6.67	16.99	0.67
BG-2	Aluminum	2.94	1.70	1.73	16.99	0.17
Average Beth. Gut	Aluminum	7.14	1.70	4.20	16.99	0.42
FPG-1	Aluminum	7.51	1.70	4.42	16.99	0.44
	Selenium	0.34	0.33	1.06	0.54	0.63
FPG-2	Aluminum	7.18	1.70	4.22	16.99	0.42
Average FPG	Aluminum	7.34	1.70	4.32	16.99	0.43
Spotted Sandpiper						
RG-2	Aluminum	4138.50	109.70	37.73	44.5	**93.00**
	Chromium	3.03	1.00	3.03	5	0.61
	Lead	6.10	3.85	1.59	11.3	0.54
	Vanadium	18.48	11.40	1.62	NA	NA
	Zinc	93.38	14.50	6.44	131	0.71
RG-2D	Aluminum	4725.90	109.7	43.08	44.5	**106.20**
	Barium	23.76	20.8	1.14	41.7	0.57

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Table C-14: Chemicals of Potential Ecological Concern (COPEC) for each Receptor
Comparison with Lowest Observed Adverse Effects Levels (LOAELs)
Drainage Channels - Virgin Island Chemical Site

Location	Analyte	Total Exposure	NOAEL Benchmark	NOAEL HQ	LOAEL Benchmark	LOAEL HQ
RG-2D	Chromium	3.41	1	3.41	5	0.68
	Lead	8.48	3.85	2.20	11.3	0.75
	Vanadium	21.63	11.4	1.90	NA	NA
	Zinc	120.80	14.5	8.33	131	0.92
RG-3	Aluminum	3978.30	109.7	36.27	44.5	**89.40**
	Chromium	2.89	1	2.89	5	0.58
	Lead	4.24	3.85	1.10	11.3	0.38
	Vanadium	15.91	11.4	1.40	NA	NA
	Zinc	67.55	14.5	4.66	131	0.52
RG-4	Aluminum	3844.80	109.7	35.05	44.5	**86.40**
	Chromium	2.58	1	2.58	5	0.52
	Lead	14.59	3.85	3.79	11.3	**1.29**
	Vanadium	13.14	11.4	1.15	NA	NA
	Zinc	66.12	14.5	4.56	131	0.50
RG-4D	Aluminum	2459.07	109.7	22.42	44.5	**55.26**
	Chromium	2.15	1	2.15	5	0.43
	Zinc	62.66	14.5	4.32	131	0.48
RG-5	Aluminum	2990.40	109.7	27.26	44.5	**67.20**
	Chromium	2.86	1	2.86	5	0.57
	Lead	27.00	3.85	7.01	11.3	**2.39**
	Vanadium	12.84	11.4	1.13	NA	NA
	Zinc	72.46	14.5	5.00	131	0.55
RG-6	Aluminum	2803.50	109.7	25.56	44.5	**63.00**
	Chromium	2.84	1	2.84	5	0.57
	Lead	11.79	3.85	3.06	11.3	**1.04**
	Vanadium	13.72	11.4	1.20	NA	NA
	Zinc	64.10	14.5	4.42	131	0.49
RG-7	Aluminum	3070.50	109.7	27.99	44.5	**69.00**
	Chromium	2.75	1	2.75	5	0.55
	Lead	6.10	3.85	1.59	11.3	0.54
	Vanadium	17.04	11.4	1.49	NA	NA
	Zinc	63.02	14.5	4.35	131	0.48
RG-8	Aluminum	2723.40	109.7	24.83	44.5	**61.20**
	Chromium	2.45	1	2.45	5	0.49
	Lead	4.66	3.85	1.21	11.3	0.41
	Vanadium	11.96	11.4	1.05	NA	NA
	Zinc	59.06	14.5	4.07	131	0.45
RG-9	Aluminum	4111.80	109.7	37.48	44.5	**92.40**
	Barium	26.30	20.8	1.26	41.7	0.63
	Chromium	3.50	1	3.50	5	0.70
	Lead	6.52	3.85	1.69	11.3	0.58
	Vanadium	22.94	11.4	2.01	NA	NA

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Table C-14: Chemicals of Potential Ecological Concern (COPEC) for each Receptor
Comparison with Lowest Observed Adverse Effects Levels (LOAELs)
Drainage Channels - Virgin Island Chemical Site

Location	Analyte	Total Exposure	NOAEL Benchmark	NOAEL HQ	LOAEL Benchmark	LOAEL HQ
RG-9	Zinc	97.09	14.5	6.70	131	0.74
RG-10	Aluminum	2536.50	109.7	23.12	44.5	**57.00**
	Chromium	2.79	1	2.79	5	0.56
	Lead	8.48	3.85	2.20	11.3	0.75
	Vanadium	12.36	11.4	1.08	NA	NA
	Zinc	63.28	14.5	4.36	131	0.48
RG-11	Aluminum	2050.56	109.7	18.69	44.5	**46.08**
	Chromium	2.37	1	2.37	5	0.47
	Vanadium	11.88	11.4	1.04	NA	NA
	Zinc	54.51	14.5	3.76	131	0.42
RG-12	Aluminum	1658.07	109.7	15.11	44.5	**37.26**
	Chromium	2.35	1	2.35	5	0.47
	Lead	4.86	3.85	1.26	11.3	0.43
	Vanadium	14.15	11.4	1.24	NA	NA
	Zinc	61.08	14.5	4.21	131	0.47
RG-13	Aluminum	3844.80	109.7	35.05	44.5	**86.40**
	Barium	29.90	20.8	1.44	41.7	0.72
	Cadmium	2.33	1.45	1.61	20	0.12
	Chromium	3.67	1	3.67	5	0.73
	Lead	22.97	3.85	5.97	11.3	**2.03**
	Selenium	0.43	0.4	1.07	0.8	0.53
	Vanadium	18.74	11.4	1.64	NA	NA
RG-13	Zinc	101.59	14.5	7.01	131	0.78
RG-14	Aluminum	1927.74	109.7	17.57	44.5	**43.32**
	Chromium	5.72	1	5.72	5	**1.14**
	Thallium	0.12	0.12	1.02	NA	NA
	Zinc	51.67	14.5	3.56	131	0.39
RG-15	Aluminum	934.50	109.7	8.52	44.5	**21.00**
	Chromium	1.84	1	1.84	5	0.37
	Zinc	45.47	14.5	3.16	131	0.35
RG-16	Aluminum	1388.40	109.7	12.66	44.5	**31.20**
	Chromium	1.95	1	1.95	5	0.39
	Zinc	54.21	14.5	3.74	131	0.41
95% UCL River Gut	Aluminum	3411.97	109.7	31.10	44.5	**76.67**
	Chromium	3.29	1	3.29	5	0.66
	Lead	11.64	3.85	3.02	11.3	**1.03**
	Vanadium	16.06	11.4	1.41	NA	NA
	Zinc	84.22	14.5	5.81	131	0.64
BG-1	Aluminum	4111.80	109.7	37.48	44.5	**92.40**
	Barium	26.97	20.8	1.30	41.7	0.65
	Chromium	3.45	1	3.45	5	0.69
	Lead	13.35	3.85	3.47	11.3	**1.18**

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Table C-14: Chemicals of Potential Ecological Concern (COPEC) for each Receptor Comparison with Lowest Observed Adverse Effects Levels (LOAELs) Drainage Channels - Virgin Island Chemical Site

Location	Analyte	Total Exposure	NOAEL Benchmark	NOAEL HQ	LOAEL Benchmark	LOAEL HQ
BG-1	Vanadium	18.21	11.4	1.60	NA	NA
	Zinc	69.18	14.5	4.77	131	0.53
BG-2	Aluminum	1065.33	109.7	9.71	44.5	**23.94**
	Chromium	1.83	1	1.83	5	0.37
	Zinc	45.02	14.5	3.10	131	0.34
Average Bethlehem Gut	Aluminum	2588.57	109.7	23.60	44.5	**58.17**
	Barium	21.89	20.8	1.05	41.7	0.53
	Chromium	2.59	1	2.59	5	0.52
	Lead	7.91	3.85	2.06	11.3	0.70
	Vanadium	13.10	11.4	1.15	NA	NA
	Zinc	59.56	14.5	4.11	131	0.45
FPG-1	Aluminum	2616.30	109.7	23.85	44.5	**58.79**
	Chromium	2.64	1	2.64	5	0.53
	Lead	9.01	3.85	2.34	11.3	0.80
	Vanadium	14.01	11.4	1.23	NA	NA
	Zinc	60.80	14.5	4.19	131	0.46
FPG-2	Aluminum	2500.88	109.7	22.80	44.5	**56.20**
	Chromium	2.64	1	2.64	5	0.53
	Lead	5.84	3.85	1.52	11.3	0.52
	Vanadium	14.49	11.4	1.27	NA	NA
	Zinc	58.36	14.5	4.02	131	0.45
FPG-3	Aluminum	2346.98	109.7	21.39	44.5	**52.74**
	Chromium	1.54	1	1.54	5	0.31
	Lead	5.74	3.85	1.49	11.3	0.51
	Vanadium	17.80	11.4	1.56	NA	NA
FPG-4	Aluminum	710.51	109.7	6.48	44.5	**15.97**
Average FPG	Aluminum	2043.66	109.7	18.63	44.5	**45.93**
	Chromium	2.36	1	2.36	5	0.47
	Lead	5.81	3.85	1.51	11.3	0.51
	Vanadium	12.64	11.4	1.11	NA	NA
	Zinc	55.56	14.5	3.83	131	0.42
Great Blue Herons						
FPG-3	Aluminum	397.83	109.70	3.63	44.5	**8.94**
	Zinc	15.86	14.50	1.09	131	0.12
FPG-4	Aluminum	120.43	109.70	1.10	44.5	**2.71**
Average FPG	Aluminum	259.13	109.70	2.36	44.5	**5.82**
	Zinc	14.62	14.50	1.01	131	0.11

HQ= Hazard quotients, if LOAEL HQ > 1, constituent may result in a reproductive effect to receptor.

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Table C-15: Chemical Concentrations Measured in Sediment Samples Compared to Screening Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Low Effects Benchmark[a] (mg/kg)	Hazard Quotient
FPG-3 Fairplain Gut	Aluminum	9150		NA	--
	Antimony	0.62	U	2	0.155
	Arsenic	1.3	BJ	8.2	0.159
	Barium	61.4	B	500[b]	0.123
	Beryllium	0.03	U	0.5[c]	0.030
	Cadmium	0.05	B	1.2	0.042
	Calcium	17900		NA	--
	Chromium	13.7		81	0.169
	Cobalt	9.3	BJ	50[d]	0.186
	Copper	25.8	J	34	0.759
	Iron	15200		NA	--
	Lead	5.6	J	46.7	0.120
	Magnesium	4210		NA	--
	Manganese	197	J	460[e]	0.428
	Mercury	0.15	U	0.15	0.500
	Nickel	7	B	20.9	0.335
	Potassium	2720	J	NA	--
	Selenium	1.2	B	NA	--
	Silver	0.18	U	1	0.090
	Sodium	21100	B	NA	--
	Thallium	0.68	U	NA	--
	Vanadium	69.4		NA	--
	Zinc	29.3	J	150	0.195
	Cyanide	1.5	U	NA	--
FPG-4 Fair Plain Gut	Aluminum	2770		NA	--
	Antimony	0.49	U	2	0.123
	Arsenic	1.7	B	8.2	0.207
	Barium	8.7	B	500[b]	0.017
	Beryllium	0.02	U	0.5[c]	0.020
	Cadmium	0.02	U	1.2	0.008
	Calcium	21300		NA	--
	Chromium	3		81	0.037
	Cobalt	3	BJ	50[d]	0.060
	Copper	6	B	34	0.176
	Iron	4320		NA	--
	Lead	2.6	J	46.7	0.056
	Magnesium	1850		NA	--

Table C-15: Chemical Concentrations Measured in Sediment Samples Compared to Screening Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Low Effects Benchmark[a] (mg/kg)	Hazard Quotient
FPG-4 Fair Plain Gut	Manganese	64.6	J	460 [e]	0.140
	Mercury	0.12	U	0.15	0.400
	Nickel	1.5	B	20.9	0.072
	Potassium	493	B	NA	--
	Selenium	0.62	U	NA	--
	Silver	0.15	U	1	0.075
	Sodium	1110	B	NA	--
	Thallium	0.54	U	NA	--
	Vanadium	16.6		NA	--
	Zinc	12.2	J	150	0.081
	Cyanide	1.2	U	NA	--
Average of sediment samples	Aluminum	5960		NA	--
	Antimony	0.2775		2	0.139
	Arsenic	1.5		8.2	0.183
	Barium	35.05		500 [b]	0.070
	Beryllium	0.0125		0.5 [c]	0.025
	Cadmium	0.03		1.2	0.025
	Calcium	19600		NA	--
	Chromium	8.35		81	0.103
	Cobalt	6.15		50 [d]	0.123
	Copper	15.9		34	0.468
	Iron	9760		NA	--
	Lead	4.1		46.7	0.088
	Magnesium	3030		NA	--
	Manganese	130.8		460 [e]	0.284
	Mercury	0.0675		0.15	0.450
	Nickel	4.25		20.9	0.203
	Potassium	1606.5		NA	--
	Selenium	0.755		NA	--
	Silver	0.0825		1	0.083
	Sodium	11105		NA	--
	Thallium	0.305		NA	--
	Vanadium	43		NA	--
	Zinc	20.75		150	0.138
	Cyanide	0.675		NA	--

[a] Low Effects Benchmarks represent the Effects Range-Low (ERL) Value (Long et al., 1995 or Long and Morgan, 1991) unless otherwise note

[b] WI Department of Natural Resources Sediment Quality Criteria (Geisy and Hoke, 1990).

[c] Apparent Effects Threshold (Fitchko, 1989).

[d] Open Water Disposal (Persuad et al., 1993).

U = Analyte was not detected above the referenced reporting limit; 1/2 detection limit was used to calculate hazard quotients.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

Average concentration measured in Fair Plain Gut used 1/2 detection limit if sample was not detected at specific location.

-- = Hazard Quotient was not calculated due to lack of benchmark.

NA: No benchmark available

Table C-16: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
RG-2	Aluminum	15500		NA	NA	--	--
	Antimony	0.53	U	2	25	--	--
	Arsenic	1.6	BJ	6	33	0.27	0.05
	Barium	70.6		500	NA	0.14	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.19	BJ	0.6	10	0.32	0.02
	Calcium	24500		NA	NA	--	--
	Chromium	16.1		26	110	0.62	0.15
	Cobalt	14.8	J	50	NA	0.30	--
	Copper	40.5	J	16	110	**2.53**	0.37
	Iron	26800		20000	40000	**1.34**	0.67
	Lead	5.9	J	31	250	0.19	0.02
	Magnesium	7650		NA	NA	--	--
	Manganese	594	J	460	1110	**1.29**	0.54
	Mercury	0.13	U	0.2	2	--	--
	Nickel	9.4	B	16	75	0.59	0.13
	Potassium	2230	J	NA	NA	--	--
	Selenium	0.68	B	NA	NA	--	--
	Silver	0.16	U	1	3.7	--	--
	Sodium	543	B	NA	NA	--	--
	Thallium	0.58	U	NA	NA	--	--
	Vanadium	69.2		NA	NA	--	--
	Zinc	140	J	120	820	**1.17**	0.17
	Cyanide	1.3	U	NA	NA	--	--
RG-2D	Aluminum	17700		NA	NA	--	--
	Antimony	0.52	U	2	25	--	--
	Arsenic	0.34	U	6	33	--	--
	Barium	89		500	NA	0.18	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.3	B	0.6	10	0.50	0.03
	Calcium	28700		NA	NA	--	--
	Chromium	19.4		26	110	0.75	0.18
	Cobalt	16.8	J	50	NA	0.34	--
	Copper	54.4	J	16	110	**3.40**	0.49
	Iron	30900		20000	40000	**1.55**	0.77
	Lead	8.2	J	31	250	0.26	0.03
	Magnesium	9070		NA	NA	--	--
	Manganese	675	J	460	1110	**1.47**	0.61
	Mercury	0.13	U	0.2	2	--	--
	Nickel	13.8	J	16	75	0.86	0.18
	Potassium	3300	J	NA	NA	--	--
	Selenium	0.65	U	NA	NA	--	--
	Silver	0.16	U	1	3.7	--	--
	Sodium	697	B	NA	NA	--	--
	Thallium	0.57	U	NA	NA	--	--
	Vanadium	81		NA	NA	--	--
	Zinc	263	J	120	820	**2.19**	0.32
	Cyanide	1.3	U	NA	NA	--	--
RG-3	Aluminum	14900		NA	NA	--	--
	Antimony	0.53	U	2	25	--	--
	Arsenic	0.86	BJ	6	33	0.14	0.03
	Barium	53.8		500	NA	0.11	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.31	B	0.6	10	0.52	0.03
	Calcium	39300		NA	NA	--	--
	Chromium	14.8		26	110	0.57	0.13
	Cobalt	13.8	J	50	NA	0.28	--
	Copper	38.8	J	16	110	**2.43**	0.35
	Iron	27300		20000	40000	**1.37**	0.68

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Table C-16: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
RG-3	Lead	4.1	J	31	250	0.13	0.02
	Magnesium	8600		NA	NA	--	--
	Manganese	792	J	460	1110	**1.72**	0.71
	Mercury	0.13	U	0.2	2	--	--
	Nickel	10.3	B	16	75	0.64	0.14
	Potassium	1500	J	NA	NA	--	--
	Selenium	0.66	U	NA	NA	--	--
	Silver	0.16	U	1	3.7	--	--
	Sodium	525	B	NA	NA	--	--
	Thallium	0.58	U	NA	NA	--	--
	Vanadium	59.6		NA	NA	--	--
	Zinc	54.4	J	120	820	0.45	0.07
	Cyanide	1.3	U	NA	NA	--	--
RG-4	Aluminum	14400		NA	NA	--	--
	Antimony	0.49	U	2	25	--	--
	Arsenic	1.2	BJ	6	33	0.20	0.04
	Barium	58.4		500	NA	0.12	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.21	B	0.6	10	0.35	0.02
	Calcium	51000		NA	NA	--	--
	Chromium	12		26	110	0.46	0.11
	Cobalt	12.8	J	50	NA	0.26	--
	Copper	33	J	16	110	**2.06**	0.30
	Iron	22700		20000	40000	**1.14**	0.57
	Lead	14.1	J	31	250	0.45	0.06
	Magnesium	6920		NA	NA	--	--
	Manganese	726	J	460	1110	**1.58**	0.65
	Mercury	0.33		0.2	2	**1.65**	0.17
	Nickel	9.8	J	16	75	0.61	0.13
	Potassium	1310	J	NA	NA	--	--
	Selenium	0.61	U	NA	NA	--	--
	Silver	0.15	U	1	3.7	--	--
	Sodium	639	B	NA	NA	--	--
	Thallium	0.54	U	NA	NA	--	--
	Vanadium	49.2		NA	NA	--	--
	Zinc	50.8	J	120	820	0.42	0.06
	Cyanide	1.2	U	NA	NA	--	--
RG-4D	Aluminum	9210		NA	NA	--	--
	Antimony	0.53	U	2	25	--	--
	Arsenic	0.34	U	6	33	--	--
	Barium	36.3	B	500	NA	0.07	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.11	B	0.6	10	0.18	0.01
	Calcium	30700		NA	NA	--	--
	Chromium	8		26	110	0.31	0.07
	Cobalt	8	BJ	50	NA	0.16	--
	Copper	19.6	J	16	110	**1.23**	0.18
	Iron	14500		20000	40000	0.73	0.36
	Lead	3.1	J	31	250	0.10	0.01
	Magnesium	4700		NA	NA	--	--
	Manganese	445	J	460	1110	0.97	0.40
	Mercury	0.19	J	0.2	2	0.95	0.10
	Nickel	6.1	B	16	75	0.38	0.08
	Potassium	754	B	NA	NA	--	--
	Selenium	1	B	NA	NA	--	--
	Silver	0.16	U	1	3.7	--	--
	Sodium	509	B	NA	NA	--	--
	Thallium	0.58	U	NA	NA	--	--
	Vanadium	32.7		NA	NA	--	--

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Table C-16: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
RG-4D	Zinc	42.6	J	120	820	0.36	0.05
	Cyanide	1.3	U	NA	NA	--	--
RG-5	Aluminum	11200		NA	NA	--	--
	Antimony	0.47	U	2	25	--	--
	Arsenic	0.91	BJ	6	33	0.15	0.03
	Barium	43.5	B	500	NA	0.09	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.15	B	0.6	10	0.25	0.02
	Calcium	81100		NA	NA	--	--
	Chromium	14.6		26	110	0.56	0.13
	Cobalt	10.3	BJ	50	NA	0.21	--
	Copper	32.9	J	16	110	**2.06**	0.30
	Iron	22300		20000	40000	**1.12**	0.56
	Lead	26.1	J	31	250	0.84	0.10
	Magnesium	7630		NA	NA	--	--
	Manganese	598	J	460	1110	**1.30**	0.54
	Mercury	0.13	J	0.2	2	0.65	0.07
	Nickel	9.6	J	16	75	0.60	0.13
	Potassium	1290	J	NA	NA	--	--
	Selenium	0.98	B	NA	NA	--	--
	Silver	0.14	U	1	3.7	--	--
	Sodium	580	B	NA	NA	--	--
	Thallium	0.52	U	NA	NA	--	--
	Vanadium	48.1		NA	NA	--	--
	Zinc	67.8	J	120	820	0.57	0.08
	Cyanide	1.2	U	NA	NA	--	--
RG-6	Aluminum	10500		NA	NA	--	--
	Antimony	0.46	U	2	25	--	--
	Arsenic	0.36	BJ	6	33	0.06	0.01
	Barium	43.5	B	500	NA	0.09	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.13	B	0.6	10	0.22	0.01
	Calcium	57000		NA	NA	--	--
	Chromium	14.4		26	110	0.55	0.13
	Cobalt	9.5	BJ	50	NA	0.19	--
	Copper	29.6	J	16	110	**1.85**	0.27
	Iron	19800		20000	40000	0.99	0.50
	Lead	11.4	J	31	250	0.37	0.05
	Magnesium	6700		NA	NA	--	--
	Manganese	513	J	460	1110	**1.12**	0.46
	Mercury	0.22	J	0.2	2	**1.10**	0.11
	Nickel	10.6	J	16	75	0.66	0.14
	Potassium	1250	J	NA	NA	--	--
	Selenium	0.57	U	NA	NA	--	--
	Silver	0.14	U	1	3.7	--	--
	Sodium	474	B	NA	NA	--	--
	Thallium	0.51	U	NA	NA	--	--
	Vanadium	51.4		NA	NA	--	--
	Zinc	45.9	J	120	820	0.38	0.06
	Cyanide	1.1	U	NA	NA	--	--
RG-7	Aluminum	11500		NA	NA	--	--
	Antimony	0.53	U	2	25	--	--
	Arsenic	0.92	BJ	6	33	0.15	0.03
	Barium	68		500	NA	0.14	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.19	B	0.6	10	0.32	0.02
	Calcium	42900		NA	NA	--	--
	Chromium	13.6		26	110	0.52	0.12
	Cobalt	11	BJ	50	NA	0.22	--

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Table C-16: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
RG-7	Copper	34.1	J	16	110	**2.13**	0.31
	Iron	21100		20000	40000	**1.06**	0.53
	Lead	5.9	J	31	250	0.19	0.02
	Magnesium	6040		NA	NA	--	--
	Manganese	531	J	460	1110	**1.15**	0.48
	Mercury	0.11	U	0.2	2	--	--
	Nickel	8.2	B	16	75	0.51	0.11
	Potassium	1750	J	NA	NA	--	--
	Selenium	0.66	U	NA	NA	--	--
	Silver	0.16	U	1	3.7	--	--
	Sodium	479	B	NA	NA	--	--
	Thallium	0.58	U	NA	NA	--	--
	Vanadium	63.8		NA	NA	--	--
	Zinc	43.4	J	120	820	0.36	0.05
	Cyanide	1.3	U	NA	NA	--	--
RG-8	Aluminum	10200		NA	NA	--	--
	Antimony	0.48	U	2	25	--	--
	Arsenic	0.31	U	6	33	--	--
	Barium	53		500	NA	0.11	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.03	B	0.6	10	0.05	0.00
	Calcium	48700		NA	NA	--	--
	Chromium	10.8		26	110	0.42	0.10
	Cobalt	8.1	BJ	50	NA	0.16	--
	Copper	25.1	J	16	110	**1.57**	0.23
	Iron	15800		20000	40000	0.79	0.40
	Lead	4.5	J	31	250	0.15	0.02
	Magnesium	5320		NA	NA	--	--
	Manganese	408	J	460	1110	0.89	0.37
	Mercury	0.19	J	0.2	2	0.95	0.10
	Nickel	6.5	B	16	75	0.41	0.09
	Potassium	1910	J	NA	NA	--	--
	Selenium	0.6	U	NA	NA	--	--
	Silver	0.14	U	1	3.7	--	--
	Sodium	522	B	NA	NA	--	--
	Thallium	0.52	U	NA	NA	--	--
	Vanadium	44.8		NA	NA	--	--
	Zinc	34.9	J	120	820	0.29	0.04
	Cyanide	1.2	U	NA	NA	--	--
RG-9	Aluminum	15400		NA	NA	--	--
	Antimony	0.56	U	2	25	--	--
	Arsenic	1.1	BJ	6	33	0.18	0.03
	Barium	98.5		500	NA	0.20	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.32	B	0.6	10	0.53	0.03
	Calcium	56200		NA	NA	--	--
	Chromium	20.2		26	110	0.78	0.18
	Cobalt	14.4	J	50	NA	0.29	--
	Copper	47.2	J	16	110	**2.95**	0.43
	Iron	27500		20000	40000	**1.38**	0.69
	Lead	6.3	J	31	250	0.20	0.03
	Magnesium	8270		NA	NA	--	--
	Manganese	708	J	460	1110	**1.54**	0.64
	Mercury	0.34	J	0.2	2	**1.70**	0.17
	Nickel	12.4	J	16	75	0.78	0.17
	Potassium	3540	J	NA	NA	--	--
	Selenium	0.69	U	NA	NA	--	--
	Silver	0.17	U	1	3.7	--	--
	Sodium	668	B	NA	NA	--	--

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Table C-16: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
RG-9	Thallium	0.61	U	NA	NA	--	--
	Vanadium	85.9		NA	NA	--	--
	Zinc	155	J	120	820	**1.29**	0.19
	Cyanide	1.4	U	NA	NA	--	--
RG-10	Aluminum	9500		NA	NA	--	--
	Antimony	0.52	U	2	25	--	--
	Arsenic	1	BJ	6	33	0.17	0.03
	Barium	52.6		500	NA	0.11	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.11	B	0.6	10	0.18	0.01
	Calcium	56700		NA	NA	--	--
	Chromium	13.9		26	110	0.53	0.13
	Cobalt	7.4	BJ	50	NA	0.15	--
	Copper	23.7	J	16	110	**1.48**	0.22
	Iron	16000		20000	40000	0.80	0.40
	Lead	8.2	J	31	250	0.26	0.03
	Magnesium	4610		NA	NA	--	--
	Manganese	431	J	460	1110	0.94	0.39
	Mercury	0.25	J	0.2	2	**1.25**	0.13
	Nickel	7.6	B	16	75	0.48	0.10
	Potassium	1650	J	NA	NA	--	--
	Selenium	1.1	B	NA	NA	--	--
	Silver	0.16	U	1	3.7	--	--
	Sodium	599	B	NA	NA	--	--
	Thallium	0.57	U	NA	NA	--	--
	Vanadium	46.3		NA	NA	--	--
	Zinc	44	J	120	820	0.37	0.05
	Cyanide	1.3	U	NA	NA	--	--
RG-11	Aluminum	7680		NA	NA	--	--
	Antimony	0.49	U	2	25	--	--
	Arsenic	0.38	BJ	6	33	0.06	0.01
	Barium	50.6		500	NA	0.10	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.05	B	0.6	10	0.08	0.01
	Calcium	32000		NA	NA	--	--
	Chromium	10.1		26	110	0.39	0.09
	Cobalt	6.7	BJ	50	NA	0.13	--
	Copper	22	J	16	110	**1.38**	0.20
	Iron	12700		20000	40000	0.64	0.32
	Lead	3.4	J	31	250	0.11	0.01
	Magnesium	3590		NA	NA	--	--
	Manganese	297	J	460	1110	0.65	0.27
	Mercury	0.39	J	0.2	2	**1.95**	0.20
	Nickel	5.6	B	16	75	0.35	0.07
	Potassium	1410	J	NA	NA	--	--
	Selenium	0.62	U	NA	NA	--	--
	Silver	0.15	U	1	3.7	--	--
	Sodium	329	B	NA	NA	--	--
	Thallium	0.54	U	NA	NA	--	--
	Vanadium	44.5		NA	NA	--	--
	Zinc	26.4	J	120	820	0.22	0.03
	Cyanide	1.2	U	NA	NA	--	--
RG-12	Aluminum	6210		NA	NA	--	--
	Antimony	0.49	U	2	25	--	--
	Arsenic	0.48	BJ	6	33	0.08	0.01
	Barium	47	B	500	NA	0.09	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.12	B	0.6	10	0.20	0.01
	Calcium	23900		NA	NA	--	--

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Table C-16: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
RG-12	Chromium	9.9		26	110	0.38	0.09
	Cobalt	6.1	BJ	50	NA	0.12	--
	Copper	18.1	J	16	110	**1.13**	0.16
	Iron	12500		20000	40000	0.63	0.31
	Lead	4.7	J	31	250	0.15	0.02
	Magnesium	2560		NA	NA	--	--
	Manganese	313	J	460	1110	0.68	0.28
	Mercury	0.11	U	0.2	2	--	--
	Nickel	4.2	B	16	75	0.26	0.06
	Potassium	1010	B	NA	NA	--	--
	Selenium	0.61	U	NA	NA	--	--
	Silver	0.15	U	1	3.7	--	--
	Sodium	293	B	NA	NA	--	--
	Thallium	0.54	U	NA	NA	--	--
	Vanadium	53		NA	NA	--	--
	Zinc	39.1	J	120	820	0.33	0.05
	Cyanide	1.2	U	NA	NA	--	--
RG-13	Aluminum	14400		NA	NA	--	--
	Antimony	0.47	U	2	25	--	--
	Arsenic	1.1	BJ	6	33	0.18	0.03
	Barium	112		500	NA	0.22	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.86	B	0.6	10	**1.43**	0.09
	Calcium	57400		NA	NA	--	--
	Chromium	21.6		26	110	0.83	0.20
	Cobalt	11.9	J	50	NA	0.24	--
	Copper	43.8	J	16	110	**2.74**	0.40
	Iron	23100		20000	40000	**1.16**	0.58
	Lead	22.2	J	31	250	0.72	0.09
	Magnesium	6600		NA	NA	--	--
	Manganese	560	J	460	1110	**1.22**	0.50
	Mercury	0.11	U	0.2	2	--	--
	Nickel	11.5	J	16	75	0.72	0.15
	Potassium	3020	J	NA	NA	--	--
	Selenium	1.6		NA	NA	--	--
	Silver	0.14	U	1	3.7	--	--
	Sodium	561	B	NA	NA	--	--
	Thallium	0.51	U	NA	NA	--	--
	Vanadium	70.2		NA	NA	--	--
	Zinc	174	J	120	820	**1.45**	0.21
	Cyanide	1.2	U	NA	NA	--	--
RG-14	Aluminum	7220	J	NA	NA	--	--
	Antimony	0.83	U	2	25	--	--
	Arsenic	1.5	BJ	6	33	0.25	0.05
	Barium	36.5	BJ	500	NA	0.07	--
	Beryllium	0.04	U	0.5	NA	--	--
	Cadmium	0.04	U	0.6	10	--	--
	Calcium	97500	J	NA	NA	--	--
	Chromium	39	J	26	110	**1.50**	0.35
	Cobalt	4.9	BJ	50	NA	0.10	--
	Copper	10.2	BJ	16	110	0.64	0.09
	Iron	9160	J	20000	40000	0.46	0.23
	Lead	3.4	J	31	250	0.11	0.01
	Magnesium	3190	J	NA	NA	--	--
	Manganese	222	J	460	1110	0.48	0.20
	Mercury	0.18	U	0.2	2	--	--
	Nickel	17	J	16	75	**1.06**	0.23
	Potassium	706	BJ	NA	NA	--	--
	Selenium	1	U	NA	NA	--	--

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Table C-16: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
RG-14	Silver	0.25	U	1	3.7	--	--
	Sodium	215	BJ	NA	NA	--	--
	Thallium	0.92	U	NA	NA	--	--
	Vanadium	28.6	J	NA	NA	--	--
	Zinc	21.8	J	120	820	0.18	0.03
	Cyanide	2	U	NA	NA	--	--
RG-15	Aluminum	3500		NA	NA	--	--
	Antimony	0.46	U	2	25	--	--
	Arsenic	0.3	U	6	33	--	--
	Barium	23.1	B	500	NA	0.05	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.02	U	0.6	10	--	--
	Calcium	800000		NA	NA	--	--
	Chromium	4.7		26	110	0.18	0.04
	Cobalt	2.2	BJ	50	NA	0.04	--
	Copper	11.8	J	16	110	0.74	0.11
	Iron	4330		20000	40000	0.22	0.11
	Lead	1.6	J	31	250	0.05	0.01
	Magnesium	1600		NA	NA	--	--
	Manganese	173	J	460	1110	0.38	0.16
	Mercury	0.11	J	0.2	2	0.55	0.06
	Nickel	1.3	B	16	75	0.08	0.02
	Potassium	665	B	NA	NA	--	--
	Selenium	0.57	U	NA	NA	--	--
	Silver	0.14	U	1	3.7	--	--
	Sodium	255	B	NA	NA	--	--
	Thallium	0.51	U	NA	NA	--	--
	Vanadium	15		NA	NA	--	--
	Zinc	13.6	J	120	820	0.11	0.02
	Cyanide	1.1	U	NA	NA	--	--
RG-16	Aluminum	5200		NA	NA	--	--
	Antimony	0.53	U	2	25	--	--
	Arsenic	0.34	U	6	33	--	--
	Barium	21.6	B	500	NA	0.04	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.08	B	0.6	10	0.13	0.01
	Calcium	46400		NA	NA	--	--
	Chromium	5.9		26	110	0.23	0.05
	Cobalt	3.1	BJ	50	NA	0.06	--
	Copper	19.9	J	16	110	**1.24**	0.18
	Iron	5780		20000	40000	0.29	0.14
	Lead	2.2	J	31	250	0.07	0.01
	Magnesium	1660		NA	NA	--	--
	Manganese	196	J	460	1110	0.43	0.18
	Mercury	0.12	U	0.2	2	--	--
	Nickel	4.2	B	16	75	0.26	0.06
	Potassium	803	B	NA	NA	--	--
	Selenium	0.66	U	NA	NA	--	--
	Silver	0.16	U	1	3.7	--	--
	Sodium	492	B	NA	NA	--	--
	Thallium	0.58	U	NA	NA	--	--
	Vanadium	17		NA	NA	--	--
	Zinc	25.9	J	120	820	0.22	0.03
	Cyanide	1.3	U	NA	NA	--	--
Average in River Gut	Aluminum	10836.47		NA	NA	--	--
	Antimony	0.26		2	25	0.13	0.01
	Arsenic	0.72		6	33	0.12	0.02
	Barium	56.35		500	NA	0.11	--
	Beryllium	0.01		0.5	NA	0.03	--
	Cadmium	0.19		0.6	10	0.31	0.02

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Table C-16: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
River Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
Average in River Gut	Calcium	92588.24		NA	NA	--	--
	Chromium	14.65		26	110	0.56	0.13
	Cobalt	9.52		50	NA	0.19	--
	Copper	29.69		16	110	**1.86**	0.27
	Iron	18368.82		20000	40000	0.92	0.46
	Lead	7.96		31	250	0.26	0.03
	Magnesium	5571.18		NA	NA	--	--
	Manganese	481.29		460	1110	**1.05**	0.43
	Mercury	0.16		0.2	2	0.78	0.08
	Nickel	8.71		16	75	0.54	0.12
	Potassium	1652.82		NA	NA	--	--
	Selenium	0.55		NA	NA	--	--
	Silver	0.08		1	3.7	0.08	0.02
	Sodium	492.94		NA	NA	--	--
	Thallium	0.32		NA	NA	--	--
	Vanadium	50.61		NA	NA	--	--
	Zinc	73.09		120	820	0.61	0.09
	Cyanide	0.64		NA	NA	--	--

[a] LEL: Lowest Effects Levels (Persuad et al., 1993), with the exception of antimony, barium, beryllium, and cobalt.

[b] SEL: Severe Effects Level (Persuad et al., 1993), with the exception of antimony, barium, beryllium, and cobalt.
Antimony: NOAA Effects Range-Low (ERL) and Effects Range-Median (ERM) (Long and Morgan, 1991).
Barium: WI Department of Natural Resources Sediment Quality Criteria (Geisy and Hoke, 1990).
Beryllium: Apparent Effects Threshold (Fitchko, 1989).
Cobalt: Open Water Disposal (Persuad et al., 1993).
Silver: NOAA ERL and ERM (Long et al., 1995).

U = Analyte was not detected above the referenced reporting limit.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

-- = Hazard Quotient not calculated; nondetect concentration or benchmark not available.

NA: Not available

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

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Table C-17: Chemical Concentrations Measured in Surface Soil Compared To Sediment Screening Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Concentratio (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
BG-1	Aluminum	15400		NA	NA	--	--
	Antimony	0.61	U	2	25	--	--
	Arsenic	0.39	U	6	33	--	--
	Barium	101		500	NA	0.20	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.16	B	0.6	10	0.27	0.02
	Calcium	39800		NA	NA	--	--
	Chromium	19.7		26	110	0.76	0.18
	Cobalt	11.4	BJ	50	NA	0.23	--
	Copper	49.3	J	16	110	**3.08**	0.45
	Iron	20400		20000	40000	**1.02**	0.51
	Lead	12.9	J	31	250	0.42	0.05
	Magnesium	5380		NA	NA	--	--
	Manganese	534	J	460	1110	**1.16**	0.48
	Mercury	0.14	U	0.2	2	--	--
	Nickel	11.7	B	16	75	0.73	0.16
	Potassium	3310	J	NA	NA	--	--
	Selenium	0.76	U	NA	NA	--	--
	Silver	0.18	U	1	3.7	--	--
	Sodium	660	B	NA	NA	--	--
	Thallium	0.67	U	NA	NA	--	--
	Vanadium	68.2		NA	NA	--	--
	Zinc	58.7	J	120	820	0.49	0.07
	Cyanide	1.5	U	NA	NA	--	--
BG-2	Aluminum	3990		NA	NA	--	--
	Antimony	0.43	U	2	25	--	--
	Arsenic	0.43	BJ	6	33	0.07	0.01
	Barium	63		500	NA	0.13	--
	Beryllium	0.02	U	0.5	NA	--	--
	Cadmium	0.02	U	0.6	10	--	--
	Calcium	19800		NA	NA	--	--
	Chromium	4.6		26	110	0.18	0.04
	Cobalt	5.4	BJ	50	NA	0.11	--
	Copper	11.2	J	16	110	0.70	0.10
	Iron	5300		20000	40000	0.27	0.13
	Lead	2.4	J	31	250	0.08	0.01
	Magnesium	1150		NA	NA	--	--
	Manganese	339	J	460	1110	0.74	0.31
	Mercury	0.1	U	0.2	2	--	--
	Nickel	3.2	B	16	75	0.20	0.04
	Potassium	582	B	NA	NA	--	--
	Selenium	0.53	U	NA	NA	--	--
	Silver	0.13	U	1	3.7	--	--
	Sodium	423	B	NA	NA	--	--
	Thallium	0.47	U	NA	NA	--	--
	Vanadium	29.9		NA	NA	--	--
	Zinc	13.1	J	120	820	0.11	0.02
	Cyanide	1.1	U	NA	NA	--	--

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Table C-17: Chemical Concentrations Measured in Surface Soil Compared To Sediment Screening Benchmarks
Bethlehem Gut - Virgin Island Chemical Site

Location	Analyte	Concentratio (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
Average in Bethlehem Gut	Aluminum	9695		NA	NA	--	--
	Antimony	0.26		2	25	0.13	0.01
	Arsenic	0.3125		6	33	0.05	0.01
	Barium	82		500	NA	0.16	--
	Beryllium	0.0125		0.5	NA	0.03	--
	Cadmium	0.085		0.6	10	0.14	0.01
	Calcium	29800		NA	NA	--	--
	Chromium	12.15		26	110	0.47	0.11
	Cobalt	8.4		50	NA	0.17	--
	Copper	30.25		16	110	**1.89**	0.28
	Iron	12850		20000	40000	0.64	0.32
	Lead	7.65		31	250	0.25	0.03
	Magnesium	3265		NA	NA	--	--
	Manganese	436.5		460	1110	0.95	0.39
	Mercury	0.06		0.2	2	0.30	0.03
	Nickel	7.45		16	75	0.47	0.10
	Potassium	1946		NA	NA	--	--
	Selenium	0.3225		NA	NA	--	--
	Silver	0.0775		1	3.7	0.08	0.02
	Sodium	541.5		NA	NA	--	--
	Thallium	0.285		NA	NA	--	--
	Vanadium	49.05		NA	NA	--	--
	Zinc	35.9		120	820	0.30	0.04
	Cyanide	0.65		NA	NA	--	--

[a] Lowest Effects Levels (Persuad et al., 1993), with the exception of antimony, barium, beryllium, and cobalt.

[b] Severe Effects Level (Persuad et al., 1993), with the exception of antimony, barium, beryllium, and cobalt.

Antimony: NOAA Effects Range-Low (ERL) and Effects Range-Median (ERM) (Long and Morgan, 1991).

Barium: WI Department of Natural Resources Sediment Quality Criteria (Geisy and Hoke, 1990).

Beryllium: Apparent Effects Threshold (Fitchko, 1989).

Cobalt: Open Water Disposal (Persuad et al., 1993).

Silver: NOAA ERL and ERM (Long et al., 1995).

U = Analyte was not detected above the referenced reporting limit.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

-- = Hazard Quotient not calculated; nondetect concentration or benchmark not available.

NA: Not available

Chemical constituents with bolded HQs are identified as Chemicals of Potential Ecological Concern.

Table C-18: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
FPG-1	Aluminum	10200		NA	NA	--	--
	Antimony	0.52	U	2	25	--	--
	Arsenic	1.4	BJ	6	33	0.23	0.04
	Barium	67.4		500	NA	0.13	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.09	B	0.6	10	0.15	0.01
	Calcium	36600		NA	NA	--	--
	Chromium	13.9		26	110	0.53	0.13
	Cobalt	8.2	BJ	50	NA	0.16	--
	Copper	33.1	J	16	110	**2.07**	0.30
	Iron	14300		20000	40000	0.72	0.36
	Lead	8.8	J	31	250	0.28	0.04
	Magnesium	3680		NA	NA	--	--
	Manganese	267	J	460	1110	0.58	0.24
	Mercury	0.13	U	0.2	2	--	--
	Nickel	7.7	B	16	75	0.48	0.10
	Potassium	2150	J	NA	NA	--	--
	Selenium	1.1	B	NA	NA	--	--
	Silver	0.16	U	1	3.7	--	--
	Sodium	570	B	NA	NA	--	--
	Thallium	0.57	U	NA	NA	--	--
	Vanadium	54.6		NA	NA	--	--
	Zinc	39.4	J	120	820	0.33	0.05
	Cyanide	1.3	U	NA	NA	--	--
FPG-2	Aluminum	9750		NA	NA	--	--
	Antimony	0.51	U	2	25	--	--
	Arsenic	2.8	J	6	33	0.47	0.08
	Barium	70		500	NA	0.14	--
	Beryllium	0.03	U	0.5	NA	--	--
	Cadmium	0.2	B	0.6	10	0.33	0.02
	Calcium	25300		NA	NA	--	--
	Chromium	13.9		26	110	0.53	0.13
	Cobalt	8.6	BJ	50	NA	0.17	--
	Copper	33.2	J	16	110	**2.08**	0.30
	Iron	14800		20000	40000	0.74	0.37
	Lead	5.7	J	31	250	0.18	0.02
	Magnesium	3670		NA	NA	--	--
	Manganese	332	J	460	1110	0.72	0.30
	Mercury	0.12	U	0.2	2	--	--
	Nickel	6.9	B	16	75	0.43	0.09
	Potassium	1940	J	NA	NA	--	--
	Selenium	0.63	U	NA	NA	--	--
	Silver	0.15	U	1	3.7	--	--
	Sodium	887	B	NA	NA	--	--
	Thallium	0.56	U	NA	NA	--	--
	Vanadium	56.5		NA	NA	--	--
	Zinc	34.2	J	120	820	0.29	0.04
	Cyanide	1.2	U	NA	NA	--	--

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Table C-18: Chemical Concentrations Measured in Surface Soil Compared to Sediment Screening Benchmarks
Fair Plain Gut - Virgin Island Chemical Site

Location	Analyte	Concentration (mg/kg)	Qualifier	Benchmarks (mg/kg)		Hazard Quotient	
				LEL[a]	SEL[b]	LEL	SEL
Average in Fair Plain Gut	Aluminum	9975		NA	NA	--	--
	Antimony	0.2575		2	25	0.13	0.01
	Arsenic	2.1		6	33	0.35	0.06
	Barium	68.7		500	NA	0.14	--
	Beryllium	0.015		0.5	NA	0.03	--
	Cadmium	0.145		0.6	10	0.24	0.01
	Calcium	30950		NA	NA	--	--
	Chromium	13.9		26	110	0.53	0.13
	Cobalt	8.4		50	NA	0.17	--
	Copper	33.15		16	110	**2.07**	0.30
	Iron	14550		20000	40000	0.73	0.36
	Lead	7.25		31	250	0.23	0.03
	Magnesium	3675		NA	NA	--	--
	Manganese	299.5		460	1110	0.65	0.27
	Mercury	0.0625		0.2	2	0.31	0.03
	Nickel	7.3		16	75	0.46	0.10
	Potassium	2045		NA	NA	--	--
	Selenium	0.7075		NA	NA	--	--
	Silver	0.0775		1	3.7	0.08	0.02
	Sodium	728.5		NA	NA	--	--
	Thallium	0.2825		NA	NA	--	--
	Vanadium	55.55		NA	NA	--	--
	Zinc	36.8		120	820	0.31	0.04
	Cyanide	0.625		NA	NA	--	--

[a] Lowest Effects Levels (Persuad et al., 1993), with the exception of antimony, barium, beryllium, and cobalt.

[b] Severe Effects Level (Persuad et al., 1993), with the exception of antimony, barium, beryllium, and cobalt.

Antimony: NOAA Effects Range-Low (ERL) and Effects Range-Median (ERM) (Long and Morgan, 1991).

Barium: WI Department of Natural Resources Sediment Quality Criteria (Geisy and Hoke, 1990).

Beryllium: Apparent Effects Threshold (Fitchko, 1989).

Cobalt: Open Water Disposal (Persuad et al., 1993).

Silver: NOAA ERL and ERM (Long et al., 1995).

U = Analyte was not detected above the referenced reporting limit.

B = Result is between the instrument detection limit and the contract required detection limit.

J = Estimated value.

-- = Hazard Quotient not calculated; nondetect concentration or benchmark not available.

NA: Not available