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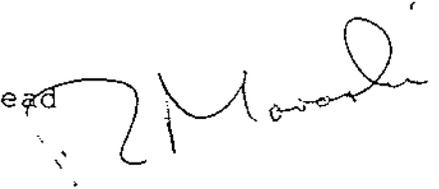
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Date Out EFB: 30 AUG 1983

To: Jay Ellenberger
Product Manager 12
Registration Division (TS-767)

From: Richard V. Moraski, Ph.D., (Acting) Head
Review Section No. 1
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)



Attached please find the environmental fate review of:

Reg./File No.: 264-331

Chemical: Aldicarb

Type Product: Insecticide/nematicide

Product Name: TEMIK

Company Name: Union Carbide

Submission Purpose: Compilation of all Union Carbide Florida
groundwater data

ZBB Code: ?

ACTION CODE: 400

Date In: 5/16/83

EFB # 3375

Date Completed: 30 AUG 83

TAIS (level II)

Days

67

20

Deferrals To:

 Ecological Effects Branch

 Residue Chemistry Branch

 Toxicology Branch

1. INTRODUCTION

1.1 Union Carbide (UC) has submitted a report containing all the aldicarb soil, surface water, and groundwater monitoring studies and their results conducted in Florida by UC. This submission also contains some UC comments on monitoring data conducted in Florida by Florida state agencies.

1.2 This report, with no accession number, is titled "TEMIK® ALDICARB PESTICIDE RESIDUES IN FLORIDA" and is divided into the following six sections:

- (1) EPA Studies in Florida, 1979-1980.
- (2) Field Soil and Water Studies in Florida, 1980-1981.
- (3) Drinking Water Well Surveys for Aldicarb in Florida.
- (4) Drinking Water Wells with Detectable Aldicarb Residues.
- (5) Non-Drinking Water Sources with Detectable Aldicarb Residues.
- (6) Miscellaneous Additional Residue Monitoring in Florida.

2. DISCUSSION OF DATA

2.1 EPA Studies in Florida, 1979-1980. Tab 1.

2.1.1 A UC memo dated September 17, 1979, from R.C. Back, states that Region IV (EPA) sampled and analyzed wells near Stoneville, MS, in northern Alabama, in Georgia, and in Florida. No detectable (ND) residues were found. The geography, hydrogeology, analytical method and aldicarb use history were not part of the memo. Therefore, no comment can be made at this time regarding the potential for aldicarb to contaminate groundwater in the above-mentioned areas. *The limit of detection is assumed to be 1ppb*

The memo additionally states that 10 wells encircling a potato growing area in Hastings, FL were sampled with all results showing ND. (Analyses were conducted by the Hastings, FL Expt Station). Well depths and distance to Temik use areas were:

<u>Depth</u> (ft)	<u>Distance</u> (ft)
25	300 - at the Exp. Sta.
86	150
400	30
80	120
85	60
56	60
85	75
76	150
80	60
150	45.

2.1.2 A U.S. EPA memo dated Feb. 26, 1980, from M. P. Halper to D. Campt provides the results of sampling and analyses of soil, surface water, and groundwater in Washington County, MS and Hillsborough County, FL. A description of the fields and the following results were submitted:

Residues of Aldicarb in Samples From Florida and Mississippi

Washington County, Mississippi

Aldicarb Conc., ppb

Soil, 0-3"	ND
Soil, 1 ft	ND
2 ft	ND
3 ft	ND
4 ft	ND
5 ft	ND
6 ft	ND
7 ft	ND
8 ft	ND
Water, 7 samples (6 wells, 1 surface) all	ND

Hillsboro County, Florida

Soil, 0-3"	ND
Soil, 1 ft	ND
2 ft	ND
3 ft	ND
4 ft	ND
5 ft	8
6 ft	20
7 ft	80
8 ft	70
Water, 3 samples (2 wells, 1 surface) all	ND
Water, see page into sampling hole approx. 350 to 375	

ND = Not Detected. Limit of detection was 1 - 2 ppb.

2.2 Field Soil and Water Studies in Florida, 1980-1981. Tab 2.

This material was reviewed in the May 10, 1982 EAB evaluation sections 2.3 and 3.3. Also, some of this material is duplicated in Tab 5 of the submission which is reviewed in section 2.5.5, below.

2.3 Drinking Water Well Surveys for Aldicarb in Florida. Tab 3.

The material in this tab is a combination of resubmitted material (but in a more complete form) reviewed in the February 9, 1983 EAB evaluation and new data.

2.3.1 The results of sampling 180 water sources (155 private wells, 18 community or municipal wells, and 7 recreational lakes) in 17 FL counties that had received aldicarb treatment, report ND residues (<2 ppb) of aldicarb in any sample. Refer to the following 10 pages.

SUMMARY OF ANALYSES OF FLORIDA DRINKING WATER WELLS FOR ALDICARB RESIDUES IN HIGH RISK USE AREAS LISTED BY COUNTY AND SAMPLE

Union Carbide Agricultural Products Co.
 Printed October 6, 1982
 Revised October 11, 1982
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EXPLANATION OF TABULAR ABBREVIATIONS

- : Data not available or not recorded during sampling.
- Well : Pvt, Pub, or Lake = private well, public well (municipal or community), or lake water (lakes only sampled at specific request of property owner).
- People : Number of persons served by the well.
- Treatd : If yes, water is treated by aeration, chlorination, or fluorination.
- Depth : Depth of well in feet as reported by owner.
- H.T. : Land surface to water table in feet at well site.
- pH : Expression of acidity and alkalinity of well water sample, with 7 as neutral, numbers lower than 7 are acid, higher are increasing alkalinity; range 0-14.
- Const : Well construction: usually driven if shallow and drilled if deep, diameter in inches and nature of casing often given.
- Use : Use of water: D = domestic (drinking, bathing, washing, etc.); I = Irrigation; R = Recreation.
- Dist : Distance in feet from well to Temik-treated acreage.
- Acres : Acres treated with Temik at or adjacent to well sampled.
- lb ai/A : Pounds of active ingredient aldicarb per acre, applied as a granular solid carrying 10 or 15% active aldicarb.
- Year : Number of years of record of Temik use.
- Month : Month in which last applied: J = January; JF = January-February; FM = February through March; M = March; MA = March-April; A = April; AM = April-May; May = May; AP = At Planting; S = Spring, SF = Spring flush.

Aldicarb Residues: Aldicarb residues found as analyzed at 2 parts per billion method sensitivity

- RD - No detectable residues observed.
- RD, III - Analysis repeated.
- W°F - Well water temperature in degrees Fahrenheit
- RF - Inches of rainfall recorded between application and sampling
- IR - Inches of irrigation water applied between application and sampling.



SUMMARY OF ANALYSES OF FLORIDA DRINKING WATER SUPPLIES FOR ALDICARB RESIDUES IN HIGH RISK AREAS LISTED BY COUNTY AND SAMPLE

Union Carbide Agricultural Products Co.
 Sampled September 1982
 Printed October 6, 1982
 Revised October 11, 1982
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EXPLANATION OF TABULAR ABBREVIATIONS

- : Data not available or not recorded during sampling.
- Well : Pvt, Pub, or Lake = private well, public well (municipal or community), or lake water (takes only sampled at specific request of property owner).
- People : Number of persons served by the well.
- Treatd : If yes, water is treated by aeration, chlorination, or fluorination.
- Depth : Depth of well in feet as reported by owner.
- W.T. : Land surface to water table in feet at well site.
- pH : Expression of acidity and alkalinity of well water sample, with 7 as neutral, numbers lower than 7 are acid, higher are increasing alkalinity; range 0-14.
- Const : Well construction: usually driven if shallow and drilled if deep, diameter in inches and nature of casing often given.
- Use : Use of water: D = domestic (drinking, bathing, washing, etc.); I = irrigation; R = Recreation.
- Dist : Distance in feet from well to Temik-treated acreage.
- Acres : Acres treated with Temik at or adjacent to well sampled.
- lb ai/A : Pounds of active ingredient aldicarb per acre, applied as a granular solid carrying 10 or 15% active aldicarb.
- Year : Number of years of record of Temik use.
- Month : Month in which last applied: J = January; JF = January-February; FM = February through March; M = March; MA = March-April; A = April; AM = April-May; May = May; AP = At Planting; S = Spring, SF = Spring flush.

Aldicarb Residues: Aldicarb residues found as analyzed at 2 parts per billion method sensitivity

- ND = No detectable residues observed.
- ND, NB = Analysis repeated.
- WH°F = Well water temperature in degrees Fahrenheit
- RF" = Inches of rainfall recorded between application and sampling
- IR" = Inches of irrigation water applied between application and sampling.

duplicate

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SUMMARY OF ANALYSES OF FLORIDA DRINKING WATER FOR ALDICARB RESIDUES IN HIGH TEBIK USE AREAS LISTED BY COUNTY AND SAMPLE

Union Carbide Agricultural Products Co.
 Sampled September
 Printed October 6, 1982
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SAMPLE	WELL	PEOPLE	TRFD	DEPTH	H.T.	PH	CONST	USE	DIST ACRES	LB a1/A	YEAR	MONTH	ALDICARB RES.		
													2 ppb	HDA	SEN
1	Pvt	-	No	05	3	7.5	2.0 case	0	50	200	2.2	4	F	ND, ND	20*
2	Pvt	6	No	00	-	7.4	2.2 case	01	-	450	2.2	4	J	ND	
3	Pvt	6	No	92	12	7.4	2.0 galv.	01	300	75	3.0	4	J	NO	
4	Pub	300	-	-	-	8.0	-	0	300	-	2.2	-	JF	NO	
5	Pvt	6	No	50	-	7.1	-	01	50	100	2.2	4	J	ND	
6	Pvt	10	No	50	-	6.6	-	01	50	100	2.2	4	JF	ND	
7	Pvt	40	No	05	10	7.8	2.0 case	0	100	70	3.0	4	J	ND	
8	Pvt	4	No	80	10	8.0	2.5 case	0	300	40	2.2	4	0	ND	
9	Pvt	10	No	60	-	7.2	1.2 case	0	0	450	3.0	4	J	ND	
10	Pvt	4	No	65	-	7.2	4.0 galv.	0	100	1200	2.5	4	JF	NO	50* 10*
11	Pvt	2	No	-	-	7.0	6.0 Art	0	400	1200	2.5	4	JF	ND	
12	Pvt	2	No	400	10	7.6	4.0 PVC	01	100	1200	2.5	4	JF	ND, ND	
13	Pvt	15	Yes	90	-	7.2	2.0 PVC	0	20	500	3.0	4	J	NO	50* 8*
14	Pvt	2	No	65	-	7.4	2.0 galv.	0	20	160	2.8	4	J	NO	
15	Pvt	5	No	60	-	7.4	1.2 case	0	50	300	2.6	4	J	NO	
16	Pvt	10	No	65	-	7.3	2.0 galv.	0	10	150	3.0	4	J	ND	
17	Pvt	4	No	230	200	8.0	2.0 galv.	0	150	1100	3.0	4	JF	NO	
18	Pvt	40	No	80	-	7.1	2.0 galv.	0	0	1100	3.0	4	JF	NO	
19	Pvt	3	No	97	80	7.4	1.5 galv.	0	50	200	3.0	4	JF	NO	
20	Pvt	50	No	04	4	7.1	2.0 galv.	0	100	105	3.0	4	JF	NO	
21	Pvt	6	No	65	-	7.2	2.0 galv.	0	20	110	3.0	4	JF	ND	
22	Pvt	6	No	85	-	7.2	2.0 galv.	01	150	35	3.0	4	H	ND	
27	Pvt	2	No	60	-	7.1	2.0 galv.	01	150	40	3.0	4	J	ND	
24	Pvt	6	No	60	0	7.7	1.2 galv.	01	660	1000	-	4	AP	ND	
25	Pvt	8	No	66	8	7.2	2.0 case	0	600	1000	-	4	AP	ND	
26	Pvt	3	No	55	10	7.2	2.0 galv.	0	30	10	3.0	4	J	ND	
27	Pvt	2	No	55	-	7.4	1.2 galv.	0	15	35	3.0	4	JF	ND, ND	
28	Pvt	20	No	00	-	6.9	2.0 galv.	0	300	80	3.0	4	JF	ND	
29	Pub	1000	Yes	200	-	7.4	8.0 case	0	700	70	3.0	4	JF	NO	
3H	Pvt	2	No	69	-	7.1	2.0 galv.	0	500	160	2.5	4	J	NO	

SUMMARY OF ANALYSES OF FLORIDA DRINKING WATER
 HIGH TEINIK USE AREAS LISTED BY COUNTY AND SAMPLE

Union Carbide Agricultural Products Co.
 Sampled in 1982
 Printed October 6, 1982
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1982 WELL WATER DATA													TEINIK USE DATA				ALDICARB RES.				
DATE	SAMPLE	WELL	PEOPLE	TRTD	DEPTH	M.T.	PH	CONST	USE	DIST	ACRES	LB #/A	YEAR	MONTH	2 ppb	MDA	SEM	HWF	RF	IR	
<u>Flagler County</u>																					
09-15	1	Pvt	10	No	05	8	6.9	2.0 galv.	0	0	265	3	5	JF	ND						
09-15	2	Pvt	10	No	85	8	7.0	2.0 galv.	DI	0	265	3	5	JF	ND				50		
<u>Putnam County</u>																					
09-14	1	Pvt	4	No	68	8	7.6	1.5 galv.	DI	300	80	3	4	JF	ND				50		
09-14	2	Pvt	2	No	86	-	8.0	1.5 galv.	DI	50	80	3	4	JF	ND						
09-14	3	Pvt	20	No	65	-	7.2	1.2 galv.	0	30	150	3	4	J	ND						
09-12	4	Pvt	5	No	140	-	7.3	4.0 galv.	DI	8	165	4	4	J	ND						
<u>Seminole County</u>																					
09-20	1	Pvt	12	No	100	0	7.5	4.0 galv.	DI	10	1.5	7.5	8	S	ND					70	
09-20	2	Pvt	12	No	400	-	7.7	4.0 galv.	DI	10	1.5	7.5	8	S	ND					70	
09-20	3	Pvt	12	No	250	0	7.7	4.0 galv.	DI	10	1.5	7.5	8	S	ND					70	
<u>Brevard County</u>																					
09-02	1	Pvt	3	No	19	19	7.0	2.0 galv.	DI	300	1	10	1	A	ND						
<u>Marion County</u>																					
09-23	1	Pvt	-	No	400	-	7.9	-	DI	20	55	5.2	1	A	ND				49	4	
09-23	2	Pvt	-	No	400	-	7.7	-	DI	0	55	5.2	1	A	ND						
09-23	3	Pvt	-	No	300	-	8.0	-	DI	0	30	5.2	1	A	ND				48	8	
09-23	4	Pvt	-	No	350	-	8.1	-	DI	0	25	5.2	1	A	ND						
09-23	5	Pvt	-	No	250	-	7.8	-	DI	0	5	5.2	1	M	ND						

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SUMMARY OF ANALYSES OF FLORIDA DRINKING WATER
 HIGH ZENK USE AREAS LISTED BY COUNTY AND SAMPLE

Union Carbide Agricultural Products Co.
 Sampled in 1982
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 Revised October 11, 1982
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DATE	SAMPLE	WELL	PEOPLE	TR70	DEPTH	M.T.	pH	CONST	USE	DIST	ACRES	ZENK USE DATA			ALDICARB RES.			
												LB a1/A	TEAR	MONTH	2 ppb	MOA	SEM	MW*F
19-10	Ocoee	Pub	1500	Yes	500	6	7.4	16.0 pipe	DI	-	-	-	-	NO	74	-	-	-
19-10	M. Garden	Pub	9000	Yes	715	-	7.3	16.0 pipe	DI	-	-	-	-	NO	70	-	-	-
19-09	1	Pvt	-	No	400	30	7.5	10.0 pipe	DI	0	35	5-10	2	NO	49	20	49	20
19-09	2	Pvt	-	No	407	31	7.6	12.0 pipe	DI	0	100	5-10	2	NO	49	20	49	20
19-09	3	Lake	15	No	Surface	-	7.4	-	RI	50	120	10	2	NO	-	-	-	-
19-09	4	Pvt	20	No	254	-	7.0	8.0 cased	DI	300	300	10	1	NO	-	-	-	-
19-09	5	Pvt	2	No	607	50	7.6	12.0 cased	DI	0	110	10	1	NO	49	49	49	49
19-09	6	Lake	-	No	Surface	-	6.3	-	RI	0	110	10	2	NO	49	49	49	49
19-09	7	Lake	-	No	Surface	-	6.4	-	RI	0	110	10	2	NO	-	-	-	-
19-09	8	Lake	-	No	Surface	-	7.4	-	RI	0	100	10	1	NO	49	49	49	49
19-09	9	Lake	-	No	Surface	-	6.4	-	RI	0	35	10	1	NO	49	49	49	49
19-09	10	Lake	-	No	Surface	-	5.0	-	RI	0	300	10	1	NO	-	-	-	-
19-09	11	Pvt	8	No	347	-	7.5	4.0 cased	DI	0	268	10	1	NO	50	-	-	-
19-09	12	Pvt	4	No	330	25	7.3	6.0 cased	DI	200	55	5	1	NO	-	-	-	-
19-09	13	Pvt	3	No	325	40	7.2	8.0 cased	DI	40	70	5	1	NO	-	-	-	-
19-09	14	Pvt	20	No	250	-	7.5	01d & Dnk	DI	0	100	5	1	NO	-	-	-	-
19-09	15	Pvt	4	No	100	-	7.5	3.0 cased	DI	50	25	5	1	NO	-	-	-	-
19-23	16	Pvt	3	No	100	-	8.0	4.0 galv	D	50	10	6.8	2	NO	50	-	-	-
19-23	17	Pvt	2	No	125	-	7.5	-	DI	100	10	6.8	2	NO	-	-	-	-

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SUMMARY OF ANALYSES OF FLORIDA DRINKING
WATER IN HIGH TEBIK USE AREAS LISTED

RESIDUES IN
DRINKING WATER SAMPLE

Union Carbide Agricultural Products Co.
Printed October 6, 1902
Revised October 11, 1902
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1902 WELL WATER DATA

ALDICARB RES.

TEBIK USE DATA

WELL	SAMPLE	WELL	PEOPLE	TR10	DEPTH	M.T.	pH	CONST	USE	DIST	ACRES	LB	AI/A	YEAR	MONTH	2	ppb	MOA	SEN	WM*F	RF**	IR**
0-09	RD7679	Pvt	4	No	150	100	-	4.0 case	01	30	1500	10	10	2	-	-	NO	NO				
9-09	1	Pvt	-	No	560	00	7.7	10.0 steel	01	50	120	10.5	10.5	3	SF		NO	NO				
9-09	2	Pvt	10	No	210	60	7.4	4.0 galv.	0	0	600	10.5	10.5	3	SF		NO	NO				
9-09	3	Pvt	-	No	635	90	7.7	8.0 steel	01	0	150	5	5	2	SF		NO	NO				
9-09	4	Pvt	-	No	590	70	7.5	10.0 steel	01	0	40	5	5	2	SF		NO	NO				20
9-09	Tavares	Pub	-	Yes	-	-	7.3	Drilled	01	-	-	-	-	-	-		NO	NO				
9-09	Leeshy	Pub	16000	Yes	94	35	7.4	Drilled	01	-	-	-	-	-	-		NO	NO		74		
9-10	Minneola	Pub	1200	Yes	470	-	7.1	10.0 cased	01	-	-	-	-	-	-		NO	NO		71		
9-10	Clermont	Pub	5600	Yes	818	-	7.3	12.0 cased	01	-	-	-	-	-	-		NO	NO				
9-10	Mascotte	Pub	409	Yes	210	-	6.8	8.0 steel	01	-	-	-	-	-	-		NO	NO				
9-10	Groveland	Pub	2600	Yes	750	-	7.1	8.0 cased	01	-	-	-	-	-	-		NO	NO				
9-20	5	Pvt	12	No	275	40	7.5	4.0 case	01	15	100	5	5	1	SF		NO	NO				
9-20	6	Pvt	1	No	300	96	7.8	4.0 case	01	0	20	5	5	2	M		NO	NO				
9-20	7	Pvt	4	No	110	7	7.2	4.0 galv	01	200	200	5	5	3	SF		NO	NO				
9-20	8	Lake	-	No	-	-	7.1	-	R1	10	200	5	5	3	SF		NO	NO				
9-23	9	Pvt	2	No	128	12	7.8	4.0 case	01	15	60	5	5	1	S		NO	NO				
9-23	10	Pvt	2	No	110	12	8.4	4.0 case	01	15	52	5	5	1	SF		NO	NO				
9-23	11	Pvt	-	No	450	60	8.0	-	01	0	60	5.2	5.2	2	SF		NO	NO				
9-23	12	Pvt	-	No	530	116	7.9	-	0	0	20	5.2	5.2	1	SF		NO	NO				
9-23	13	Pvt	2	No	200	90	8.4	-	01	15	10	5.2	5.2	1	SF		NO	NO				45
9-23	14	Pvt	-	No	300	-	7.9	-	01	0	60	5.2	5.2	1	SF		NO	NO				
9-23	15	Pvt	-	No	130	28	8.0	-	01	25	14	5.2	5.2	1	SF		NO	NO				Groves above well
9-23	16	Pvt	-	No	429	0	8.4	-	01	0	16	5.2	5.2	1	SF		NO	NO				
9-23	17	Pvt	3	No	195	-	0.0	4.0 case	01	15	40	5.2	5.2	1	SF		NO	NO				
9-23	18	Pvt	-	No	185	70	8.1	-	01	0	24	10	10	2	SF		NO	NO				
9-23	19	Pvt	-	No	300	-	0.0	8.0 case	01	0	35	5.2	5.2	1	SF		NO	NO				
9-23	20	Pvt	-	No	300	-	8.1	10.0 case	01	0	50	2.6	2.6	1	SF		NO	NO				

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SUMMARY OF ANALYSES OF FLORIDA DRINKING WATER THROUGH TEMIK USE AREAS LISTED BY COUNTY AND SAMPLE

Union Carbide Agricultural Products Co.
 Sampled in 1902
 Printed October 6, 1982
 Revised October 11, 1982
 Page 6 of 9

1982 WELL WATER DATA													TEMIK USE DATA				ALDICARB RES.		
DATE	SAMPLE	WELL	PEOPLE	TRIO	DEPTH	M.T.	pH	CONST	USE	DIST ACRES	LB a1/A	YEAR	MONTH	2 ppb MOA	SEM	W*F	RF*	IR*	
Dade County																			
9-09	1	Pvt	6	No	300	40	7.9	4.0 case	D	30	10	2	M	NO					
9-09	2	Pvt	4	No	225	10	8.1	4.0 case	0	600	50	2	M	NO			10		
9-09	3	Pvt	4	No	360	10	8.2	4.0 case	0	400	50	1	May	NO, ND					
9-09	4	Pvt	4	No	360	12	7.8	6.0 case	D1	400	50	1	M	NO					
9-09	5	Pvt	25	No	300	10	8.0	4.0 case	D	50	30	1	M	NO			6		
9-09	6	Pvt	12	No	400	15	7.8	4.0 case	0	200	50	2	M	ND					
9-09	7	Pvt	4	No	300	12	0.0	4.0 case	0	100	15	1	M	ND					
9-09	8	Pvt	4	No	310	10	8.2	4.0 case	0	100	50	1	May	ND					
Dade County																			
9-10	1	Pvt	6	No	170	15	7.7	4.0 case	0	150	35	1	May	ND			1.5		
9-10	2	Pub	25	Yes	350	15	8.1	4.0 case	D	50	35	1	May	ND					
9-10	3	Pvt	2	No	300	15	7.8	4.0 case	D	250	5	1	MA	ND					
9-10	4	Pvt	2	No	300	15	7.9	4.0 case	D	300	5	1	MA	ND					
9-10	5	Pvt	4	No	300	15	7.4	4.0 case	0	1 mille	10	1	May	ND					
9-10	6	Pvt	4	No	450	15	7.7	4.0 case	D	150	10	1	May	ND					
9-10	7	Pvt	6	No	300	10	-	4.0 case	D1	330	6	1	May	ND					
9-10	8	Pub	60	Yes	1000	30	7.9	4.0 case	D	1300	2200	2	MA	NO, ND					
Dade County																			
9-15	1	Pvt	3	No	300	30	8.1	2.0 pipe	0	300	45	1	M	NO			2		
9-15	2	Pvt	6	No	700	30	7.3	2.0 case	D1	0	10	1	M	NO					
9-15	3	Pvt	3	No	300	30	7.5	4.0 case	0	50	10	1	M	ND					
9-15	4	Pvt	3	No	-	-	7.6	10.0 case	D1	0	20	1	M	NO					
9-15	5	Pvt	-	No	600	20	7.6	12.0 case	01	0	80	1	M	ND					
9-15	6	Pvt	10	No	400	20	7.0	8.0 case	01	0	5	1	M	NO					
9-15	7	Pvt	10	No	750	100	8.0	4.0 case	01	10	95	1	M	NO					
9-15	8	Pvt	2	No	251	140	8.2	4.0 case	0	300	95	1	M	NO					
9-15	9	Pub	6	Yes	300	-	7.8	Municipal	D1	300	95	1	M	NO					
9-15	10	Pvt	4	No	30	10	7.4	4.0 case	0	600	10	1	M	ND					
Dade County																			
9-21	1	Pvt	2	No	200	12	7.8	2.0 case	01	0	10	3	M	ND					

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SUMMARY OF ANALYSES OF FLORIDA DRINKING WATER
WELLS FOR ALOICARB RESTORES IN
HIGH TESTIK USE AREAS LISTED BY COUNTY AND SAMPLE

Union Carbide Agricultural Products Co.
Printed October 6, 1982
Revised October 11, 1982
Page 7 of 9

Sampled in
r 1902

1982 WELL WATER DATA

YEMIK USE DATA

ALDICARB RES.

AIE	SAMPLE	WELL	PEOPLE	TRTO	DEPTII	H.T.	PHI	CONST	USE	QIIST	ACRES	LB	AI/A	YEAR	MONTH	2 ppb	MOA	SEN	MIN	RF	IR
Indian River County																					
9-17	1	Pvt	0	No	600	6	6.3	Art.	1	0	60	10	3	F		NO				40	
9-17	2	Pvt	3	No	50	5	5.8	Orlven	0	50	60	10	3	F		NO				40	
9-17	3	Pvt	10	No	600	5	6.1	Art.	10	0	50	10	3	F		NO				50	
9-16	6	Pvt	20	No	60	3.5	6.9	Orlilled	01	25	90	7.5	3	F		NO				50	
9-16	7	Pvt	0	No	600	3.5	6.8	Drilled	01	0	90	7.5	3	F		NO				50	
9-16	8	Pvt	0	No	600	3.5	7.5	Drilled	01	0	90	7.5	3	F		NO				50	
9-07	8	Pvt	30	No	900	4	7.8	Orlilled	01	0	230	5	2	M		NO				40	
9-16	9	Pvt	5	No	60	6	7.0	Orlilled	01	100	5	6.7	1	May		NO				45	
Lucie County																					
9-13	1	Pvt	3	No	80	6	7.0	Orlven	01	200	10	5	1	M		NO				40	
9-13	2	Pvt	3	No	1000	6	7.7	Art.	1	300	10	5	1	M		NO				40	
9-13	3	Pvt	3	No	100	6	7.6	Orlven	01	50	10	5	1	M		NO				40	
9-13	7	Pvt	0	No	1000	5	7.0	Orlilled	1	25	20	5+10	1	A		NO				40	
9-13	8	Pvt	10	No	40	5	7.1	Orlven	0	200	20	5+10	1	A		NO, NO				40	
9-13	4	Pvt	15	No	60	6	7.1	Orlven	0	50	50	6.7	1	May		NO				40	
9-13	5	Pvt	0	No	1000	6	7.0	Orlilled	1	50	50	6.7	1	May		NO, NO				40	
9-13	6	Pvt	0	No	1000	6	7.8	Orlilled	1	300	50	6.7	1	May		NO				40	
9-13	9	Pvt	2	No	1000	5	7.6	Art.	1	15	22	5	1	A		NO				40	
9-13	10	Pvt	2	No	60	5	7.4	Orlilled	01	500	10	5	1	May		NO				40	
9-16	1	Pvt	10	No	60	5	7.7	Orlilled	01	50	84	6	1	A		NO				40	
9-16	2	Pvt	0	No	1000	5	7.8	Orlilled	1	0	04	6	1	A		NO				40	
9-16	3	Pvt	5	No	30	5	7.1	Orlilled	01	50	100	6	1	A		NO				40	
9-16	4	Pvt	5	No	30	5	7.0	Orlilled	01	50	100	6	1	A		NO				40	
9-16	5	Pvt	4	No	60	5	7.1	Orlilled	01	0	80	6	1	A		NO				40	
9-14	3	Pvt	5	No	100	6	6.9	Drilled	01	150	20	6.7	1	M		NO				40	

10-

REPORT OF ANALYSES OF FLORIDA DRINKING WATER
 HIGH TENUK USE AREAS LISTED BY COUNTY AND SAMPLE

Union Carbide Agricultural Products Co.
 Sampled: 1982
 Printed October 6, 1982
 Revised October 11, 1982
 Page 8 of 9

1982 WELL WATER DATA

TENUK USE DATA

ALDICAR RES.

DATE	SAMPLE	WELL	PEOPLE	TRTD	DEPTH	M.T.	pH	CONST	USE	DIST ACRES	LB #1/A	YEAR	MONTH	2 ppb	HDA	SEN	W/F	RF*	IR*	
19-07	1	Pvt	25	No	60	3.5	7.2	Drilled	OI	100	1800	5	1	AM	NO				31	
19-07	2	Pvt	25	No	60	3.5	6.8	Orilled	OI	100	1000	5	1	AM	NO				31	
19-07	3	Pvt	4	No	30	3.5	7.2	Driven	OI	200	1800	5	1	AM	NO				31	
19-07	5	Pvt	-	No	60	3.5	7.3	Orilled	OI	700	1000	5	1	AM	NO				31	
19-07	7	Pvt	-	No	30	3.5	7.3	Driven	OI	-	450	5	1	AM	NO, HO				31	
19-07	4	Pvt	10	No	600	3.5	7.1	Orilled	OI	1320	1000	5	1	AM	NO				31	
19-07	6	Pvt	2	No	15-30	3.5	5.2	Driven	OI	1100	1800	5	1	AM	NO				32	
19-10	1	Pvt	210	Yes	103	3.5	7.3	Orilled	DI	100	1800	5	1	AM	NO				31	
19-10	2	Pub	2400	Yes	115	5	7.3	Gra. Packed	DI	1 mile	2500	5	1	AM	NO				32	
9-14	1	Pub	12000	Yes	105	5	7.3	Driven	OI	-	200	10	5	-	NO				40	
9-14	2	Pvt	5	No	60	5	7.1	Drilled	DI	50	1800	5	1	AM	NO				32	

Aln Beach County

9-15	4	Pvt	10	No	00	4	7.1	Drilled	OI	100	50	5	1	F	NO				40	
9-15	5	Pvt	5-10	No	40	4	6.3	Orilled	0	150	215	6.7	2	FM	NO				50	
9-15	6	Pvt	5-10	No	40	4	6.8	Drilled	D	150	215	6.7	2	FM	NO				50	
9-15	7	Pvt	5-10	No	40	4	6.9	Orilled	0	150	215	6.7	2	FM	NO				50	

Alc County

1-15	1	Pvt	0	No	20	4	7.0	Orilled	I	500	4	7.5	1	May	NO, HO				50	
1-15	2	Pvt	5	No	15	4	7.4	Orilled	OI	25	10	10	3	May	NO				50	
1-15	3	Pvt	5	No	15	4	7.3	Orilled	DI	25	10	10	3	May	NO				50	

This material did not address the issues raised in the February 9, 1983 evaluation such as: Was the method only for parent compound (aldicarb)? What is the hydrogeology of the subject areas?

2.3.2 Drinking Water Well Sampling in Northeast Florida, 1983.

Potatoes are grown throughout 20,000 acres in the tri-county area of St. Johns, Putnam and Flagler counties, just east of the St. John's River. The soil is reported to be pH 5.5 - 6.5. About 78% of the wells in the area are <100 feet deep and about 2/3 of the fields had been treated annually with Temik for at least 5 years. In 83% of the wells sampled, the wells were within 500 feet of Temik-treated land.

Over 150 well sites were sampled (with some duplicate sampling) by Florida state agency personnel and 112 of the samples were analyzed by UC. UC found no detectable residues (<1 ppb) in any of the samples provided to them.

As part of this report, a paper titled "A Summary of Potato Production and Use of Nematicides in Northeast Florida", by D. P. Weingartner (a pathologist with the Agricultural Research Center, Hastings, FL), was included. This paper stated that an estimated 100% of the 20,000 acres planted to potatoes is treated with Temik at 3 lb ai/A and that an advantage of using Temik is "Heavy rains and cool soil temperatures do not prohibit use of Temik" and it can be used effectively during cool, wet weather.

Conclusions

(1) A description of the analytical method, the method of storage of the samples between sampling and analysis and the results of analysis of the other samples are needed.

(2) The paper included with this report provides evidence that Temik is used in Florida potato production during periods of heavy rains, cool soil temperatures, and cool wet weather. These conditions maximize potential for groundwater contamination.

2.3.3 Drinking Water Well Sampling in the Central Ridge Citrus Growing Area, Florida 1983.

In February 1983, sampling was done at 252 wells in Marion, Lake, Orange, and Polk counties. Wells varied in depth from 23 - 687 feet and pH 4.3 - 10.5 with the pH increasing with the depth of the well and the sampled wells were within 500 feet of treated groves. Groves treated with Temik for 1 year, 2 years, and 3 years were in the ratio of 2:1:1. About 80% of the groves were treated at 5 lb ai/A and most of the rest were treated at 10 lb ai/A. UC states that 175 wells in the area were sampled in September 1982 and all results for aldicarb were negative. Only 1 of the drinking water wells showed positive results (6 ppb) and is discussed in section 2.4.1, below.

It is not known if the 175 wells sampled in September 1982 were resampled among the 252 wells sampled in this study.

2.4 Drinking Water Wells with Detectable Aldicarb Residues.
Tab 4.

2.4.1 [REDACTED]

Only 1 well, [REDACTED] was found to have detectable residues (6 ppb) and a hydrogeologic investigation by Dames and Moore (consulting hydrologists) revealed that the well can be contaminated with surface runoff water since the well is near the center of a depressed area and the well (1 1/4 inch galvanized pipe) was corroded and not sealed to prevent surface runoff from entering the space between the well and the borehole. [REDACTED] reported that his home and the well are surrounded by standing water during periods of heavy rain.

Conclusions

It cannot be stated that the aldicarb contamination of the [REDACTED] well was due to aldicarb groundwater contamination and not due to surface runoff.

2.4.2 [REDACTED]

This area is a fernery of about 17 acres in size and was treated with Temik 15G yearly for 5 years. The latest treatment was made in October 1982 at 11.25 lb ai/A. A 239 foot deep well (Well 1) is located in the center of the fernery, 15 feet from the Temik use area and was first sampled on February 1, 1983 by Florida state agencies and was resampled on February 16. UC sampled the well on February 18, in addition to 33 other wells (Wells 2 - 34) located adjacent to the fernery which were 100 - 500 feet deep. These wells all showed ND. UC also sampled 4 shallow monitoring wells, designated "North", "East", "SE", and "E" (Wells 35 - 38) at the fernery on February 18 and sampled 5 irrigation wells (Wells 39 - 43) at the fernery on February 23 in addition to taking soil cores at the fernery and sampling the Southeast drainage pond. Five additional irrigation wells at the fernery (Wells 44 - 48), all over 100 feet deep, were sampled on February 23. On February 25, a new well (Well 49) was drilled 97 feet north of the original to a depth of 100 feet with sampling of soil to 5 foot intervals to 50 feet and at 10 foot intervals from 50 feet to 100 feet. This new well was sampled on March 4.

Results

See Table on next page.

PRIVACY ACT EXEMPTION

<u>Water or soil sample</u>	<u>Depth, feet</u>	<u>pH</u>	<u>Date Sampled</u>	<u>Residues ppb</u>	<u>Analysis done by</u>
Well 1	239		Feb 1	2 - 3	FL Dept Hlth
" "	"		Feb 16	5.3	" "
" "	"		"	3.5	" "
" "	"	7.5	Feb 18	4	UC
" "	"	6.7	Mar 17	3	UC
Wells 2-34	100-500	7.3-8.1	Feb 18	ND	UC
Well 35	shallow	7.6	"	52	UC
Well 36	" "	7.7	"	15	UC
Well 37	" "	4.4	"	130	UC
" "	" "	4.5	Mar 17	17	UC
Well 38	" "	8.8	Feb 18	ND	UC
SE drainage pond			Feb 18	5	UC
Wells 39-43	?	7.2-7.4	Feb 23	ND - 1	UC
Soil cores at the fernery	0 - 1 1 - 2 2 - 19 in 2' incre.	6.5 6.7 4.3- 5.8	Feb 23 " " "	66 14 ND	UC UC UC
Wells 44-48	>100		Feb 23	ND - 1	UC
New well soil cores	5 - 6 10 - 11 15 - 16 20 - 21 25 - 26 30 - 31 35 - 36 40 - 101 drilling mud	5.0 4.6 4.6 5.0 5.0 4.8 5.0 4.2 - 9.1	Feb 25 " " " " " " " "	ND 9 44 19 ND 10 14 ND 2	UC UC UC UC UC UC UC UC
Well 49	100		Mar 4	2	UC

Conclusions

Between sampling and analysis, the samples were placed in a cooler. A more detailed description of the storage method used between sampling and analysis is needed.

The page containing the introduction/summary to [redacted] mentions 5 irrigation wells (in paragraphs 6 and 7) being sampled on Feb 23. Is this repetitive or are 10 different wells indeed being described (Wells 39 - 43 and Wells 44 - 48)?

The centrally located well (Well 1) is surrounded with concrete which would prevent seepage around the casing. Therefore, the contaminated groundwater is probably due to leaching of aldicarb and not surface runoff into the well.

2.5 Non-drinking Water Sources with Detectable Aldicarb Residues. Tab 5.

2.5.1 Indiantown Grove Test Site

This is one of two monitoring sites selected by the Florida DER in 1982; it is west of Indiantown in Martin County. The soil is very sandy with a water table within 2 - 5 feet of the surface. The site is a 20 acre block of oranges with 43 north to south rows of 24 trees per row. It is a flood irrigated, bedded grove and at least the western portion of the grove is underlain by a hard clay layer at 7 - 10 feet below the surface.

In 1982, rows 1 - 4 and 18 - 19 received 50 lb/A of Temik, rows 5 - 7 and 18 - 20 received 15 lb/A and rows 21 - 45 received 40 lb/A of Temik.

Groundwater samples were taken at 5 points among tree rows 1 - 5, at one point between tree rows 20 and 21 and at one point between rows 42 and 43. In addition, ditch water and 5 nearby potable water wells (all about 100 feet in depth) were sampled.

Results

See the following 6 pages.

Comments

Please verify that rows 18 - 19 received a total of 65 lb/A of Temik.

The "Test Design" section claims 45 rows but Fig. 1 shows the grove to have 43 rows. In addition, the well designations are not consistent in that the wells are called "shallow wells", "deep wells", "permanent wells", and "test wells".

2.5.2 [REDACTED] Fernery.

This site, just north of Deland in Volusia County, is a 20 acre tract planted to ferns and is protected from direct sunlight by plastic screening on 8-foot poles. The fernery is heavily fertilized and is watered by both rainfall and sprinkler irrigation. The tract slopes slightly toward a water retaining pond which has a pH of 4.5. The water in the retaining pond is recycled for use in irrigation.

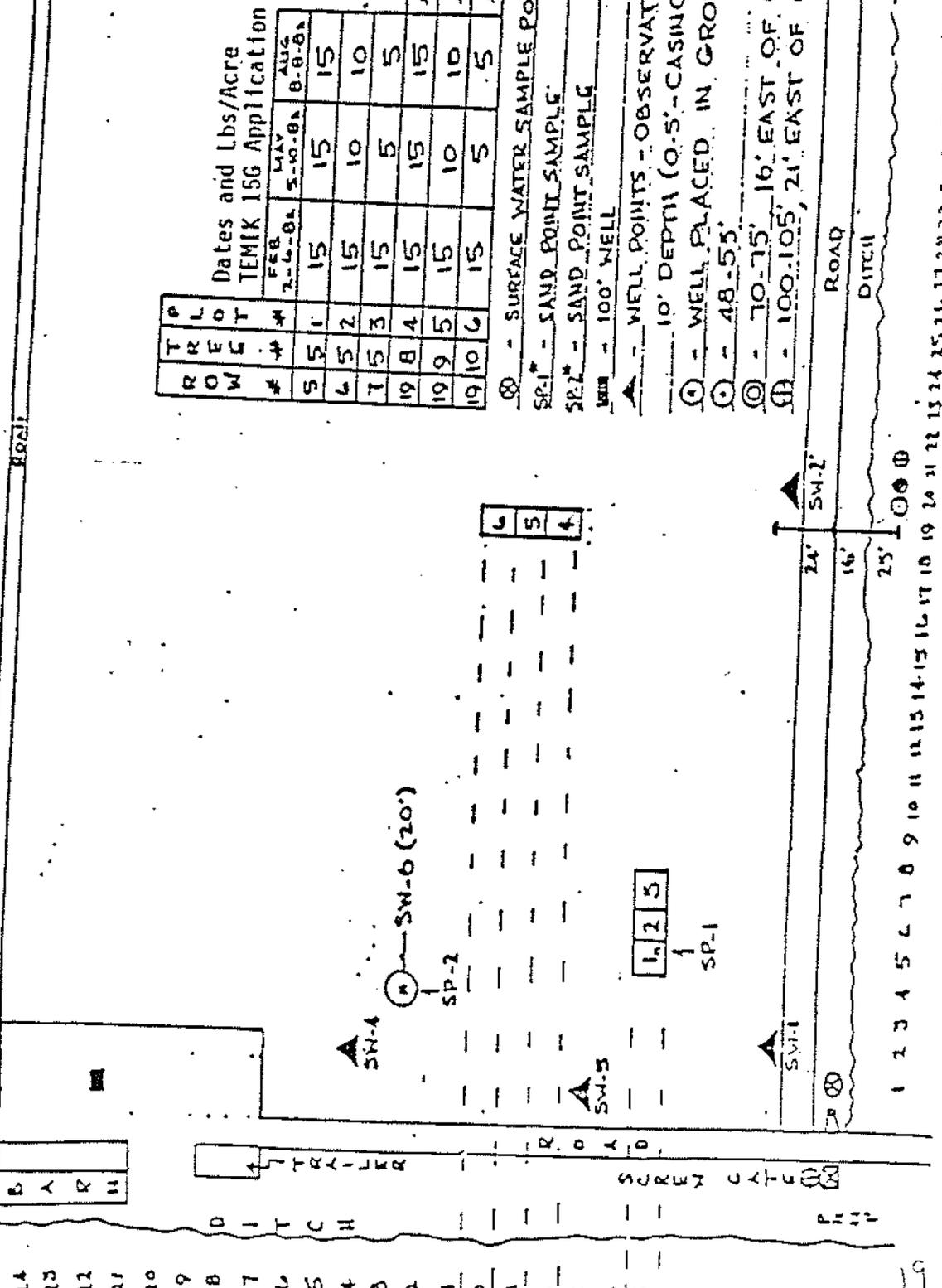
PRIVACY ACT EXEMPTION

Gravo Wa. Samples
1903

Well Name (Depth)	Sampling Date	Sampler	Depth to Water (feet)	Field Measurements of Sample Water			Aldicarb Residues (ppb)	
				pH	Temperature (C)	Conductivity (microhms)	UCAPC	OCR
Shallow Well 1 (10 feet deep)	1/0/03	HFB	3'9"	7.7	22	810	ND	231,222
	1/25/03	HFB					154	
	3/23/03	HLR/UCAPC					110	
Shallow Well 2 (10 feet deep)	1/0/03	HFB	3'1"	7.6	22	1100	0	3
	1/25/03	HFB					452	
	3/23/03	HLR/UCAPC						
Shallow Well 3 (10 feet deep)	1/0/03	HFB	3'3"	7.0	22	1190	2	NO
	1/13/03	HFB					1	2
	1/25/03	HFB						
Shallow Well 4 (10 feet deep)	1/25/03	HFB	5'0"	NS	NS	NS	4	3
	3/23/03	HFB					1	NS
		HLR/UCAPC						
Shallow Well 5 (10 feet deep)	1/0/03	HFB	5'7"	7.2	20	1220	10	NO
	1/13/03	HFB					19	
	1/25/03	HFB						
Shallow Well 6 (17 feet deep)	1/11/03	HLR/UCAPC	5'3"	6.8	23	1050	NO	1
	1/25/03	HFB					2	ND
	3/23/03	HLR/UCAPC						
Heap Well 6 (31 feet deep)	1/11/03	HLR/UCAPC	3'7"	6.6	24	600	NO	NO
	1/25/03	HFB					2	
	3/23/03	HLR/UCAPC						
Deep Well 7 (71 feet deep)	1/11/03	HLR/UCAPC	4'3"	6.7	23	600	NO	NO
	1/25/03	HFB					ND	
	3/23/03	HLR/UCAPC						
Heap Well 8 (105 feet deep)	1/11/03	HLR/UCAPC	5'1"	7.1	23	600	NI	NO
	1/25/03	HFB					ND	
	3/23/03	HLR/UCAPC						
Canal	1/11/03	HLR/UCAPC	27h 4	ND	27h 4	ND	ND	
	2/2/03	HFB						

FIGURE 1

INDIANTOWN, MARTIN COUNTY, FLORIDA
1-7-83



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 26 27 28 29 30

Test Well Designations, Locations, and Temik Treatments Applied^{1/}

Test Well	Location Row Tree		Dates of Application & lbs Temik 15G applied-at or near test well site								
			1982			1981	1980				
			Feb. 6	May 10	Aug. 8	Mar-Apr	Mar-Apr				
Temporary											
SP-1	5	5	15	+	15	+	15	20	+	20	67
SP-2	8	13	50					50			67
Permanent											
1	2	1	50					50			67
2	20	1	15					15	+	15	50
3	43	12	40					50			unt
4	2	13	50					50			67
5	1	7	50					50			67

^{1/} Given the rapidity of aldicarb degradation, high water infiltration rates, and shallow depth of groundwater, time after treatment may be more important than dosage or exact well position.

It is notable that SP-1, when sampled only 10 days after last application, showed an average residue of 9 ppb at 2.5', 14 ppb at 5', and 14 ppb at 6.5'. This location had the highest application loading over the preceding three year period: 152 lb TEMIK 15G formulation or 25.33 lb active aldicarb.

Aldicarb residues and water pH as determined by DER and UCC from DER sand points installed, sampled, and removed August 18, 1982, [redacted] grove, Indiantown, FL.

Well Designation	Depth from land surface	pob total aldicarb		pH of water	
		DER	UCC	DER	UCC
SP-1	2.5'	8	10	6.1	7.2
	5.0'	11	15	7.0	7.4
	6.5'	5	23	6.2	7.6
	7.0'	No water sample ^{1/}			
	10.0'	No water sample ^{1/}			
SP-2	7.0' on slope at drip line	1	NS		
	10.0' on bed	129	115	6.3	7.6
Surface water ^{2/}		1			

^{1/} notation from field: dry, clay, no water. See comment in text, page 1.

^{2/} 6' lower than water table. This is in ditch at SW corner of grove.

NS = No sample

Aldicarb residues as determined by DER and UCC from Permanent Test Wells installed by DER, So. Fla. Water Mgmt. District, [redacted] on September 8 and 14, 1982, Indiantown, FL.

Test Well ^{1/} Designation	Water Depth from land surface in inches	Sample Rep. ^{5/}	ppb aldicarb by sampling dates and labs							
			9-11 UCC	9-16 DER	9-16 UCC	10-3 UCC	10-11 UCC	10-25 ^{2/} UCC	11-16 UCC	12-13 UCC
1	49 ^{3/}	1	5	3	9	ND	NS	2	NS	1
		2	8		8		2			1
		3	9							
2	32.5 ^{3/}	1	2	ND		ND	NS	NS	NS	1
		2	2							1
3	37 ^{3/}	1	9	4		ND	NS	4	NS	ND
		2	9							ND
4	52 ^{4/}	1		35	55	25	20	16	14	2
		2					20			2
5	74 ^{4/}			2	46	ND	NS	NS	NS	ND

ND = No detectable residue at 1 ppb sensitivity
NS = No sample

^{1/}Wells 1, 2, 3 installed September 8; Wells 4 and 5 installed September 14.

^{2/}10-25 samples were drawn the day that flood irrigation waters were discharged.

^{3/}Water level from ground surface 9-11-82.

^{4/}Water level from ground surface 9-16-82.

^{5/}On 9-11, Rep. 1 taken without bailing well. Rep. 2 taken after bailing well dry then allowing it to refill before sampling. Rep. 3 taken after repeating Rep. 2 process. On subsequent sampling dates, all wells bailed twice before sampling.

PRIVACY ACT EXEMPTION

Water pH from test wells as determined by DER and UCC from permanent test wells installed by DER, So. Fla. Water Mgmt. District, [REDACTED] on September 8 and 14, 1982, Indiantown, FL.

Test Well No. and depth	pH of water by date and laboratory				
	9-11 UCC	DER	9-16 UCC	10-3 UCC	10-25 UCC
1	7.3	6.7*	7.1	7.6	7.8
2	7.4			8.2	
3	7.2			7.8	7.8
4		6.7*	7.8	8.4	7.3, 7.3
5			7.2	8.2	

*Field water temperature 26°C.

PRIVACY ACT EXEMPTION

Results

To date, only results from sampling the [redacted] fernery pond are available. However, one drinking water well of unspecified depth and sampled at an unspecified time was found to not contain detectable residues.

Between October 1982 and February 1983, the water retaining pond contained between 58 and 89 ppb residues. The lower value was found in February 1983.

Comments

The dates of aldicarb application are not given and a map showing the location of the wells in relation to the treated area is not provided. Also, a description of the analytical method used was not given.

2.5.3 Alcoma Grove Test Site.

This 20 acre site is located about 50 miles east of Lake Wales in Polk County, FL and is one of two sites selected for monitoring by the Florida DER in 1982. The other site is at a grove in Indiantown, Martin County.

The grove generally slopes southward (a total of about 25' from the north to south borders). On March 12 and June 3, 1982, 28.1 lb and 34.4 lb/A of (presumably) Temik 15G was applied to the site, respectively. Between September 27 and November 4, 1982, monitoring wells were installed in the grove at depths from 28 - 43 feet by the Florida DER. The depth to the water at the 5 monitoring wells is 16 - 26 feet. In addition, one deep well, 262 feet deep, was drilled into the Floridan aquifer and was screened at 252 - 257 feet.

Twenty-two (22) drinking water wells in the vicinity of Alcoma grove were sampled of which 15 were >220 feet deep, 6 were 25 - 30 feet deep and one was reported as <100 feet deep.

Results

See the next 2 pages.

Comments/Conclusions

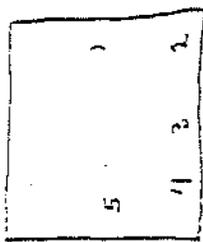
Previous Temik use history is needed. If this was the only application of Temik made at this site, then groundwater contamination may not yet have occurred. Soil samples would have been helpful.

PRIVACY ACT EXEMPTION

Alcoma Grove Water Cycles

Well	Sampling Date	Sampler	Depth to Water (feet)	Field Measurements of Sample Water		Aidicarb Residues (ppb)
				Temperature (microohms)	Conductivity (microohms)	
Well 1 (43 feet deep)	12/8/02	DER	23'	5.8	245	ND
	12/16/02	UCAPC				
	1/20/03	DER/UCAPC				
Well 2 (28 feet deep)	12/8/02	DER	15' 11"	6.6	260	46
	12/17/02	UCAPC				
	1/20/03	DER/UCAPC				
Well 3 (28 feet deep)	12/8/02	DER	17' 5"	6.1	470	125
	12/17/02	UCAPC				
	1/20/03	DER/UCAPC				
Well 4 (33 feet deep)	12/8/02	DER	16' 6"	6.4	300	91
	12/17/02	UCAPC				
	1/20/03	DER/UCAPC				
Well 5 (37.5 feet deep)	12/8/02	DER	17' 7"	6.2	300	100
	12/17/02	UCAPC				
	1/20/03	DER/UCAPC				
Well 6 (37.5 feet deep)	12/8/02	DER	19' 1"	6.2	320	1
	12/17/02	UCAPC				
	1/20/03	DER/UCAPC				
Well 7 (37.5 feet deep)	12/8/02	DER	27'	6.1	330	39
	12/17/02	UCAPC				
	1/20/03	DER/UCAPC				
Well 8 (37.5 feet deep)	12/8/02	DER	26' 1"	6.0	430	65,419
	12/17/02	UCAPC				
	1/20/03	DER/UCAPC				

241



3-31-82

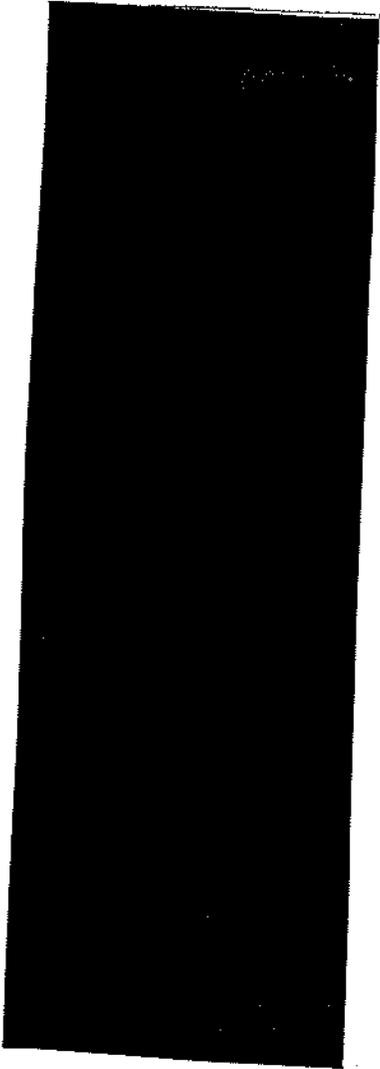
ST. ANNE SHRINE RD WATER SAMPLES
 Taken 12-20-82 by Romero, Run 12-21 by RTP.
 Letters Sent 12-21 to Homeowners
 Reported to TIF 12/21/82

- 25 -

PRIVACY ACT EXEMPTION

People Name

Depth Street # Inst. Date Const. WT Rx



380						
305				4" Galv.		N
220		'76		2" Galv.	40	N
330					25	N
>300				1"	25	N
>400						Filtered
>400				Unk.	20	N
30				Brown	25	
30				2" Galv.	25	N
< 100					25	N
25				2" Galv.	2	N
150					18	N
30					18	N
30				1 1/2 Galv.		N
>300					20	N
405				1 1/2 x 4" Cased		N
>400						N
30						N
520				Galv. Sandpoint		N
460						N
490						
220						

Lake
 >50 people

Surface Lake

Lake

2.5.4 The [redacted] Grove Well.

This well is in southwest Orange County, FL, off highway 535, north of Lake Buena Vista at the edge of a grove between 2 orange trees. The grove is sandy soil and slopes gently to the north to a small lake. The water table is 3 feet below the surface. The grove was treated during the past 3 years with 67 pounds/A of Temik 15G with last year's (1982) application being split with 33 pounds/A being applied in late July 1982.

The well is 29 feet deep and was first sampled on Feb. 5, 1983 but due to earlier damage by grove equipment, the well was removed and replaced. A monitoring well was also drilled 16 feet from the well to a depth of 29 feet (with screening between 24 and 29 feet), outside the grove area and 8 feet from the dripline.

Results

Sample Date	ppb aldicarb residues and water pH			
	[redacted] Grove Well		New Monitor Well	
	ppb	pH	ppb	pH
February 5, 1983	6	5.4	--	--
February 9, 1983	8	--	--	--
February 22, 1983	-	--	19	5.4
March 3, 1983	-	--	19	5.1
March 17, 1983	9	5.1	7	5.6

2) Results of samples taken in Orange County (the towns of Windermere, Orlando, Ocala, and Wintergarden) were not reported.

Conclusions

The occurrence of residues in this well are probably the result of aldicarb residues leaching through the soil and contaminating the groundwater.

PRIVACY ACT EXEMPTION

2.5.5 The [REDACTED] Location

This material was previously reviewed in the April 8, 1981 EAB evaluation (pg. 20 - 25) and in the May 10, 1982 EAB evaluation (sections 2.3 and 3.3) except for some new soil data and old soil data not previously submitted. Therefore, all the data will be summarized in this review.

The [REDACTED] Grove [REDACTED] Hillsborough County, FL. Soils in Hillsborough County are commonly fine sand which are readily permeable and acidic but limed to bring the pH up. The top 6 feet of the soil in the [REDACTED] Grove contain 93 - 98% sand, 0.1 - 1.4% organic matter (which decreases with depth) and pH 4.9 - 5.8 (which decreases with depth). In 1979 and 1980, Temik 15G was applied at 67 lb/A and 65 lb/A, respectively.

Some of this material is duplicated in Tab 2, which is reviewed in section 2.2, above.

Results

Soil data from the treated grove generally shows aldicarb residues to dissipate from the top 4 feet of soil to levels of 0 - 10 ppb within 1 year. However, as the residue level in the top 4 feet declines, deeper soil strata (4 - 8 feet) show an increase in aldicarb soil residue concentration with time and the residues are still evident at 100 - 200 ppb at 6 months post-application and at about 30 - 40 ppb after 1 year has elapsed.

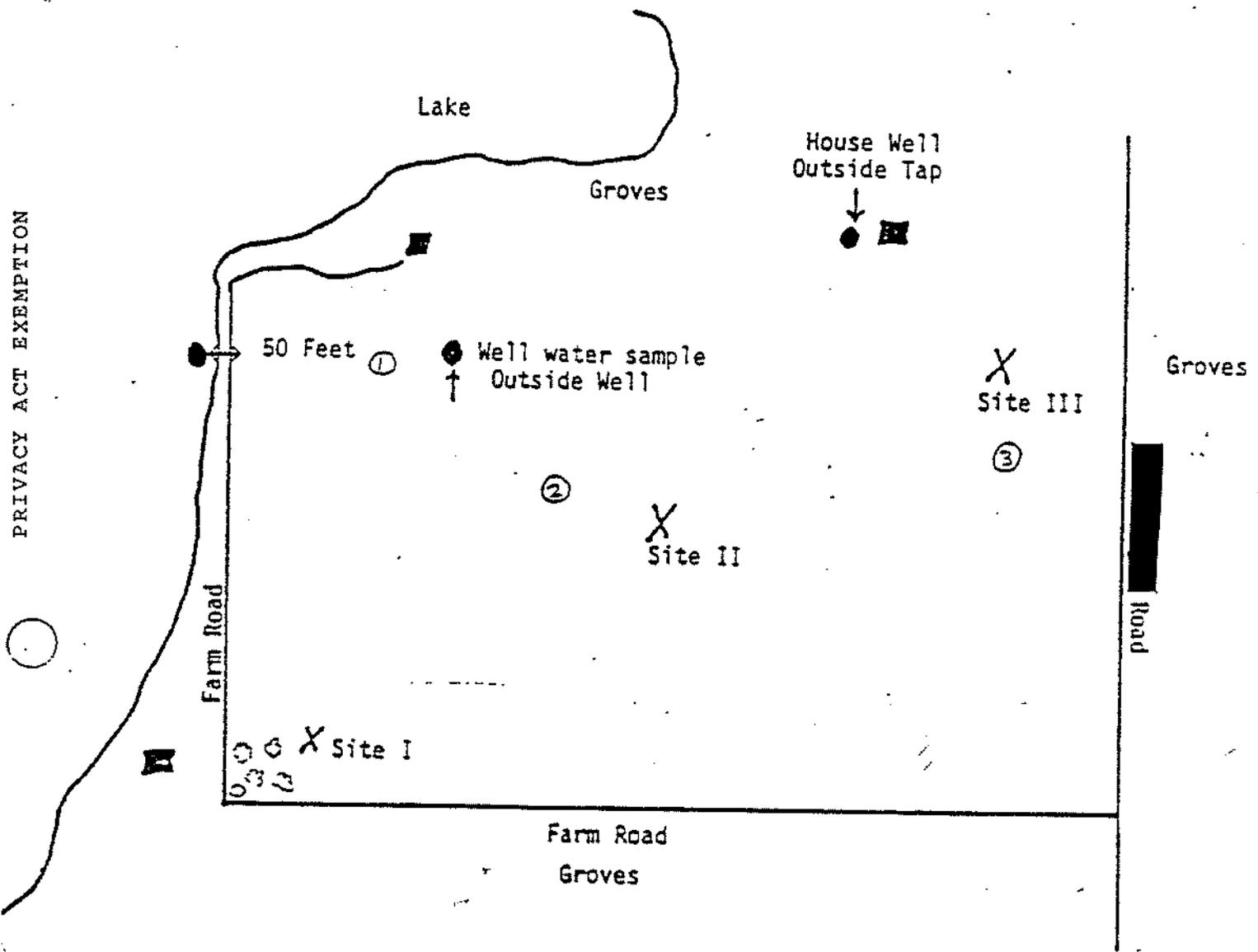
Analysis of a 150 foot well showed 2 and 8 ppb at 3 and 6 months after an application at 10 lb ai/A. However, UC analysis showed ND. Analyses of other wells of unspecified depths (see page 30) showed either 1 ppb or ND when sampled at various times between June 5, 1980 and November 11, 1981 after yearly late winter applications of 10 lb ai/A.

The report contains a statement that on February 23, 1983, the Florida DER found 315 ppb aldicarb residues in a shallow well belonging to [REDACTED]. The location of this well in relation to the treated area, the depth of the well, and whether Temik was applied in 1982 are not provided. Also water wells from the treated grove and in the "vicinity" of the treated grove were sampled on March 8, 1983 and showed ND. All of the 5 wells were greater than 100 feet deep except for 1 which was of undetermined depth and the pH of the well water was between 7.2 and 7.4. Also, 2 wells equipped with cluster sampling at 4 different depths between 8 feet and 13'7" in the treated grove were sampled on March 25, 1983 and showed ND at 8 feet but 18 ppb and 82 ppb at 13'7" and 12'2", respectively.

PRIVACY ACT EXEMPTION

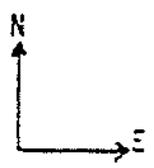
Grove - Location Map

-28-



Soil Type: Blanton fine sand.
 Surface contour drops to the west and northwest.
 Groundwater flow gradient: To the west.

- - Water Sample Site
- - Residence
- X - Soil Sample Site



Location-Grove History

PRIVACY ACT EXEMPTION

Year	Crop	TEMIK 15G/Acre (Lbs.)	Application Method and Timing
1980	Oranges	67	Band applied - March 15.
1979	Oranges	65	Band applied - Late Feb.
1978	Oranges		
1977	Oranges		
1976	Oranges		

Table 31. Grove Soil Sample Results, PPR Total Aldicarb Residues

Site No.	Soil Depth (Ft.)	Sampled June 5, 1980	Soil Depth (Ft.)	Sampled September 10, 1980
I	Top 1	676	Top 1	27
	1-2	244	1-2	28
	2-4	6	2-4	48
	4-6	ND	4-6	77
	6-8	ND	6-8	109
II.	Top 1	233	Top 1	31
	1-2	26	1-2	27
	2-4	14	2-4	22
	4-6	ND	4-6	47
	6-8	ND	6-7 <u>1/</u>	122
III.	Top 1	18	Top 1 <u>2/</u>	48
	1-2	NO	1-2	116
	2-4	29	2-4	98
	4-6	67	4-5 <u>1/</u>	212
	6-8	ND	Groundwater	

1/ Core terminated due to groundwater.

2/ Site III, September 10 sampling changed to different tree due to lack of accessibility of tree sampled on June 5, 1980.

Table 32. Location Water Sample Results, P98 Total Aldicarb Residues

Source Description	Well Depth (Ft.)	Sampled June 5, 1980		Sampled September 10, 1980	
		IRD	UCC	IRD	UCC
Lake Water		ND	ND	5	NO
Outside Well	150	ND	ND	ND	ND
House Tap	150	2	ND	8	ND

EXPOSURE ASSESSMENT BRANCH REVIEW dated 8-30-83

Page _____ is not included in this copy.

Pages 31 through 32 are not included in this copy.

The material not included contains the following type of information:

- Identity of product inert ingredients
 - Identity of product impurities
 - Description of the product manufacturing process
 - Description of product quality control procedures
 - Identity of the source of product ingredients
 - Sales or other commercial/financial information
 - A draft product label
 - The product confidential statement of formula
 - Information about a pending registration action
 - FIFRA registration data
 - The document is a duplicate of page(s) _____
 - The document is not responsive to the request
-

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

RESULTS OF SOIL ANALYSES IN HILLSBOROUGH COUNTY

10 lb a1/A on 2/25/79
 10 lb a1/A on 3/15/80
 10 lb a1/A on 3/20/81

Tenth Application#	Soil Strata (feet)	Aldicarb Residue (ppb)					
		6/5/80	9/10/80	2/4/81	5/13/81	6/4/81	7/29/81
Site 1	0-1	676	27	6	19	1670	ND
	1-2	244	20	ND	ND	92	5
	2-4	6	48	33	ND	ND	ND
	4-6	ND	77	67	ND	ND	10
Site 2	0-1	ND	109	64	ND	ND	19
	1-2	233	31	34	ND	226	54
	2-4	26	27	5	ND	41	49
	4-6	14	22	ND	ND	10	6
Site 3	0-1	ND	47	5	ND	ND	62
	1-2	ND	122*	45	ND	ND	118
	2-4	18	ND	ND	ND	51	ND
	4-6	ND	116	ND	1244	2093	34
Average	0-1	29	98	ND	7	7	ND
	1-2	67	212*	ND	ND	ND	27
	2-4	ND	ND	ND	ND	ND	109
	4-6	309	35	13	421	ND	66*
Average	0-1	90	57	2	3	1330	29
	1-2	16	56	11	2	47	18
	2-4	22	112	17	ND	3	30
	4-6	ND	115	36	ND	ND	79
							35

*Soil core terminated due to water.

MECHANICAL SOIL ANALYSES

Location	PH	Organic Matter* (VL %)	Sand** (VL %)	Clay** (VL %)	Silt** (VL %)	Cation Exchange Capacity (mg/100g)
Hillsborough County						
Top foot	5.75	1.4	93	2	2	3.4
4-6 foot Layer	4.85	.1	96	2	0	.5
Polk County (First Location)						
Top foot	7.65	.6	90	6	4	2.4
4-6 foot Layer	7.94	.1	92	6	2	.4
Polk County (Second Location)						
Top foot	5.90	.6	94	4	2	.3
4-6 foot Layer	4.15	.6	94	4	2	1.2
Indian River County						
Top foot	5.85	.1	94	4	2	2.0
4-6 foot Layer	6.2	.2	63	14	3	16
Saint Lucie County						
Top foot	5.5	1.1	92	4	4	2.0
4-6 foot Layer	7.65	.1	63	14	3	23

1331

*COD typo oxidation (wt)

**Dry soil base



INTERNAL CORRESPONDENCE

UNION CARBIDE AGRICULTURAL PRODUCTS COMPANY, Inc.
P O BOX 12014 1 W ALEXANDER DRIVE RESEARCH TRIANGLE PARK N C 27709

To (Name) R. L. Bertwell
Division
Location RTP
Floor Number 1148

Date March 24, 1983
From (Name & Dept.) R.R. Romine
Registration Analytical
Chemistry

Copy to R.C. Back
S.L. Harrison
R.L. Jones
G.G. Madgwick

Subject [Redacted] Plot
Residue Monitoring

FL-DER found residues of 315 ppb in a shallow well on [Redacted] Hillsborough County, FL on 2/23/83. We confirmed the finding on that sample and DER indicated they were conducting "holding time" studies using that water (this review was detailed in my 3/16/83 letter).

Additional samples of soil and water were taken from that land and vicinity by Union Carbide on 3/8/83. Results are tabulated.

WATER WELLS

	Depth	pH	Residue
C 704 #1	155 ft	7.4	NO
C 705 #2	100 ft	7.4	NO
C 706 #3	unsure	7.4	NO
C 707	120 ft	7.3	NO
C 708	135 ft	7.2	NO

SOIL CORES

Stratum	Site I		Site II	
	PH	Residue	pH	Residue
0-1 ft	5.2	8 ppb	5.6	NO
1-2 ft	5.4	NO	5.5	NO
2-4 ft	5.4	NO	5.7	NO
4-6 ft	4.8	NO	5.3	NO
6-7 ft (GW)	4.5	NO	(GW-5 ft)	
Groundwater	4.7	3 ppb	5.7	30 ppb

RECEIVED

MAR 25

R. C. BACK

R. R. Romine
R. R. Romine

PRIVACY ACT EXEMPTION



INTERNAL CORRESPONDENCE

- 35 -

UNION CARBIDE AGRICULTURAL PRODUCTS COMPANY, Inc.

To (Name) R.L. Bertwell
 Division
 Location RTP
 Floor Number 1148

Copy to R.C. Back
 S.L. Harrison
 R.L. Jones
 G.G. Madgwick

Date March 30, 1983
 From (Name & Dept) R.R. Romine
 Registration Analytical
 Chemistry

Subject [Redacted] Site
 Water Monitoring

Two clusters of monitoring wells at the [Redacted] grove, [Redacted] FL were sampled and shipped by Minter/Kirkland on 3/25/83. Previous results from this site are in my letters of 3/16/83 and 3/24/83.

UCC No.	Sample ID	pH	Residue
C791	Cluster 1 Well 1	4.3	ND
C792	Cluster 1 Well 2	4.3	18 ppb
C793	Cluster 2 Well 1	4.4	ND
C794	Cluster 2 Well 3	4.3	82 ppb

RRR/sr

R. R. Romine

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MAR 31 1983

R. C. [Redacted]

35

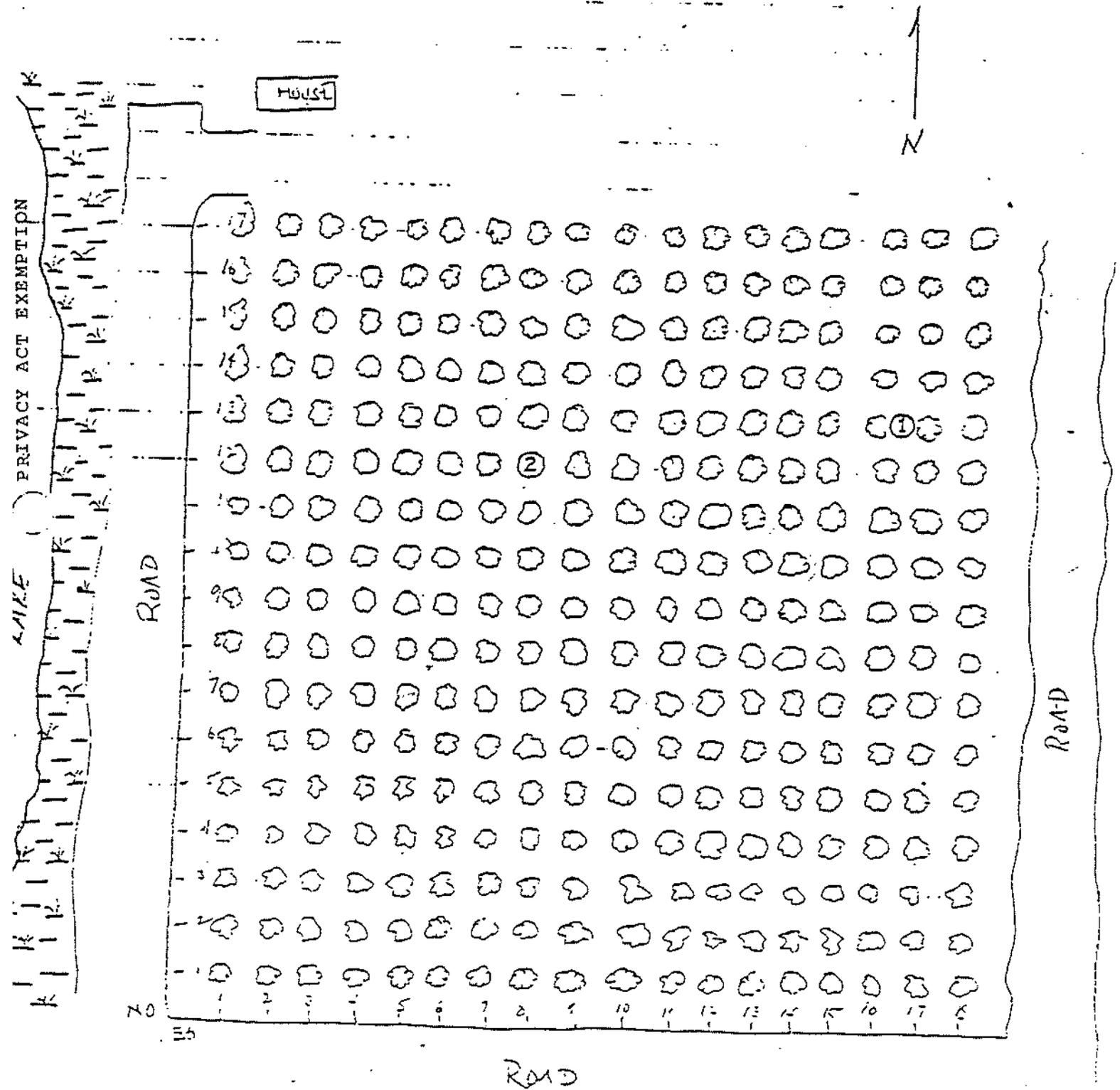
Hillsborough County Groves Water Samples

Sampling Date	Sampler	Depth to Water (feet)	Field Measurements of Sample Water			Aldicarb Residues (ppb) UCAPC	Residues (ppb) DER
			pH	Temperature C	Conductivity (microohms)		
3/25/03	DLH/UCAPC		4.6	19	120	ND	ND
3/25/03	HLR/UCAPC		4.3	21	790	18	18
3/25/03	DLH/UCAPC		4.5	20	520	ND	ND
3/25/03	DLR/UCAPC		4.4	21	700	82	82

Cluster 1 Well 1 (0' deep)
Cluster 1 Well 2 (13'7" deep)
Cluster 2 Well 1 (0' deep)
Cluster 2 Well 3 (12'2" deep)

HILLSBORO COUNTY

[REDACTED] GROVE



CLUSTER 1 N 13.0 E 16.5

CLUSTER 2 N 12.0 E 7.5 / 8.5

2.6 Miscellaneous Additional Residue Monitoring in Florida.
Tab 6.

2.6.1 A domestic and irrigation use well in Wintergarden, FL [redacted] which is 200 feet deep in an area where the water table is about 80 feet deep, was sampled 3 times on May 11, 1981 and the samples were frozen immediately. Analysis of the samples in late August 1981 showed ND.

UCC Number	Romero Bottle No.	Description	Residue, ppb
15509	#1	Main Cherry Lake Well	ND
15510	#2	(Same Well) Shop Faucet	ND
15511	#3	(Same Well) Foreman's House	ND

Comments

Use history and hydrogeology is needed.

2.6.2 UC analyzed orange concentrate for the Coca Cola Company and found ND (method sensitive to 10 ppb). This information is not germane to EAB.

2.6.3 Well samples from Polk (4) and Manatee (2) counties on October 27, 1982, showed ND.

Use history and hydrogeology is needed.

UCC No.	Date Sampled	Sample Description	pH	Residue
RB5567	10/27/82	Polk 10-27-82-1	4.7	ND
RB5568	10/27/82	[redacted] -2	4.3	ND
RB5569	10/27/82	[redacted] -3	8.3	ND
RB5570	10/27/82	[redacted] -4	7.6	ND
RB5571	10/27/82	Manatee 10-27-82-1	7.4	ND
RB5572	10/27/82	[redacted] -2	8.0	ND

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2.6.4 Wells simultaneously sampled by UC and the Florida Dept. of Hlth and Rehab. Services. The UC results showed ND.

UCC No.	Sample Code	Well Owner, Town	Residue
<u>POLK COUNTY</u>			
C525	2-14-83-1	[REDACTED]	ND
<u>HILLSBOROUGH COUNTY</u>			
C526	2-14-83-1	[REDACTED] Plant City	ND
C527	-2	[REDACTED] Plant City	ND
C528	-3	[REDACTED] Plant City	ND
C529	-4	[REDACTED] Plant City	ND
C530	(35 ft well)-5	[REDACTED] Bowling Green	ND
C531	(20 ft well)-6	[REDACTED] Bowling Green	ND,ND

Comments

Use history and hydrogeology are needed.

2.6.5 A well in Orange County, Florida.

UCC No.	Sample Description	Well Depth	Distance from Field	pH	Residue	FLORISIL NO YES
C532	[REDACTED] Lockhart, FL	65'	100'	8.2	ND,ND	ND,ND (4 analyses)

Comments

Use history and hydrogeology are needed.

PRIVACY ACT EXEMPTION

2.6.6 Wells in the Ft. Pierce area in St. Lucie and Indian River counties

UCC No.	Watson's Code	Well Owner	Well* Depth	Distance from Treated Area	Residue	
<u>ST. LUCIE CO.</u>						
CS14	2-9-83-1	[REDACTED]	50'	100'	ND	
CS15	-2		90'	50'	ND	
CS16	-3		150'	1/2 mi	ND	
CS17	-4		110'	1/2 mi	ND	
CS18	-5		200'	100'	ND	
CS19	-6		35'	50'	ND	
CS20	-7		30'	100'	ND	
<u>INDIAN RIVER CO.</u>						
CS21	2-9-83-8		[REDACTED]	100'	300'	ND
CS22	-9			45'	100'	ND
CS23	-10	600'		100'	ND	
CS24	-11	—		25'	ND	

* The water table is a consistent 10' for all samples.

Comments

Use history and hydrogeology are needed.

2.6.7 Three (3) Drinking Water Wells in Orange County, Florida.

UCC No.	Sample ID	Sample Date	Depth	Distance from Field	pH	Residue
C761	# 1-11	2/25/83	Shallow	100 ft.	7.2	ND
C762	# 2-12	2/28/83	180 ft.	200 ft.	7.1	ND
C763	# 3-15	2/28/83	240 ft.	250 ft.	7.3	ND

Comments

Use history and hydrogeology are needed.

PRIVACY ACT EXEMPTION

2.6.8 [REDACTED] Grove

This is a 20 acre grove in Hernado County, FL and was treated with aldicarb 10 lb ai/A in the spring of both 1980 and 1982. Someone living adjacent to the grove asked the grove owner to discontinue using aldicarb so as to maintain the integrity of the groundwater. The grove owner asked UC to sample the wells which was done on March 10, 1983. The wells were all within 500 feet of the grove, were all over 200 feet deep and the water table was at 100 feet. No detectable residues were found in any of the 4 wells sampled.

UCC No.	Lanning Sample ID	Depth	pH	Residue
C722	#1 [REDACTED] - House	285 ft.	7.5	ND
C723	#2 [REDACTED] - Trailer	400 ft.	6.9	ND
C724	#3 [REDACTED] - House	600 ft.	7.6	ND
C725	#4 [REDACTED] House	215 ft.	7.6	ND
C726	#5 [REDACTED] House	215 ft.	7.4	ND

3. CONCLUSIONS/RECOMMENDATIONS

3.1 The only data received by EAB relative to aldicarb and groundwater monitoring in Florida have been submitted by UC. This submission contains the results of analysis of 715 wells (drinking and non-drinking) of which 44 showed positive (> 1 ppb) results for aldicarb residues. However, the last page of Tab 3 of this submission shows a county map of Florida indicating 827 drinking water wells (not including non-drinking water wells) have been tested for aldicarb residues. (See the next page for a copy of the map). This discrepancy needs to be rectified.

3.2 Monitoring reports submitted by UC to date show Florida groundwater contamination with aldicarb to not be widespread. In addition, one of the wells contaminated with aldicarb residues is probably the result of surface water containing aldicarb, running down the side of the well and into the well water through a broken well pipe.

However, there are serious problems and deficiencies with the submitted monitoring data which prevent a conclusion as to the geographical extent, residue levels and temporal trends of groundwater contamination that will result from the agricultural use of aldicarb in Florida. One or more of the following points is not addressed in each of the monitoring reports submitted:

- (1) The reports consistently lack details of the hydro-geology of the treated area (direction and velocity of groundwater flow, depth to the water table and not just depth to the well, identity of which aquifer is being monitored, etc.)

PRIVACY ACT EXEMPTION

(2) Since a groundwater contaminant does not disperse (rapidly) but moves as a plume within the groundwater, there is no guarantee that the wells that were sampled were in the path of the plume of contamination. (See the figure on page .) Justification is needed as to why a well of a certain depth or screened at a certain depth would be expected to pick up the plume of contamination.

(3) Use history of aldicarb in the monitoring sites.

(4) Wells were not sampled over a period of a year or two to determine if levels of contamination were increasing or decreasing.

(5) Maps showing location of wells in relation to treated area and direction of groundwater flow are not submitted.

(6) The analytical method is not described. EAB can only assume that the total residue method (oxidation of the residues to the sulfone) is used.

(7) Soil cores are not always taken. The absence of groundwater residues but the presence of residues in soil just above the water table may mean that the groundwater may become contaminated within the following year.

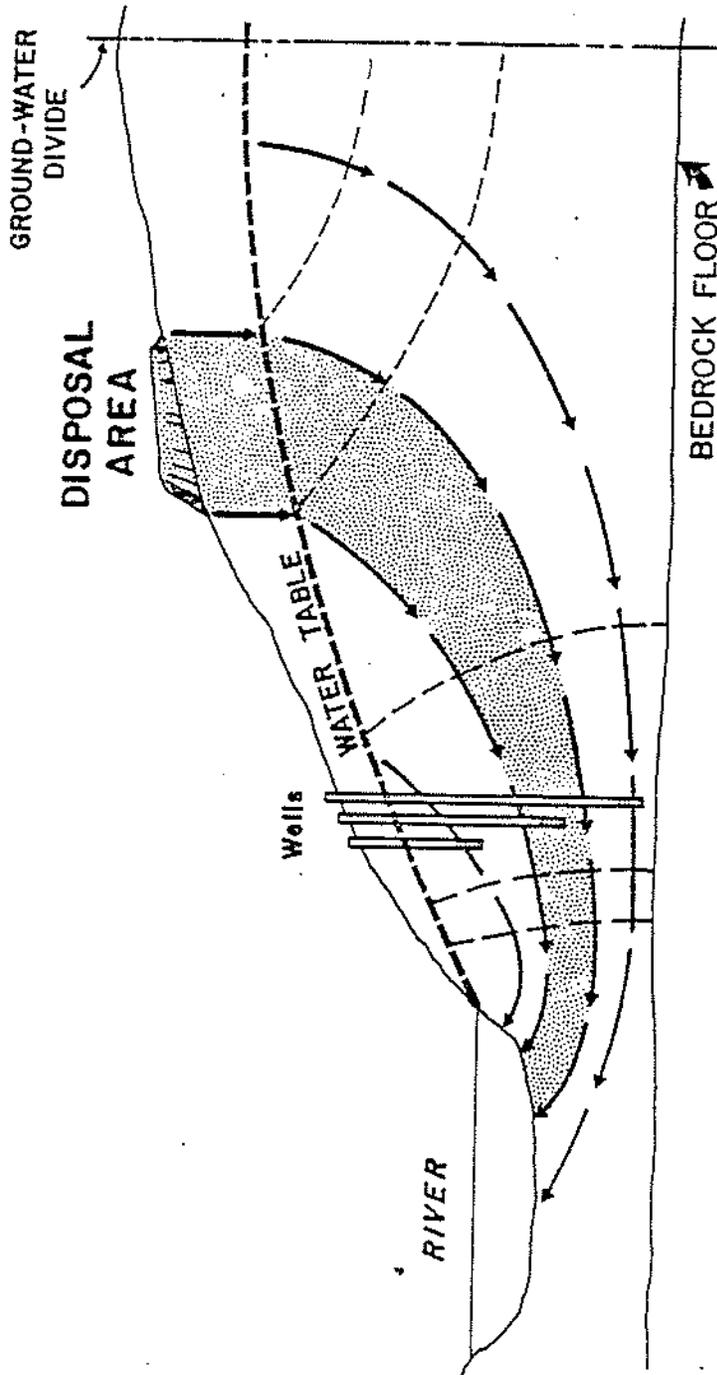
(8) Rainfall/recharge - Rainfall has been less than normal over the past 20 - 25 years.

In addition, it is recommended that the following, which can influence potential for and levels of aldicarb groundwater contamination, be investigated:

(1) Influence of herbicide use in orchards (to remove grass competing for water and nutrients) on pH of soil. A reference¹ shows orchard soil pH to be lower on the bare soil area due to leaching of exchangeable bases (such as Ca and Mg). Persistence of aldicarb residues is favored by acid pH.

(2) Weather and soil conditions. UC has suggested in the past² that application a few weeks later in the season can result in faster degradation and less residues leaching due to higher soil temperatures and less rainfall. However, EAB's response² showed this to not always be the case. In addition, Dr. Weingartner's statement in section 2.3.2, above, shows that aldicarb is chosen by farmers, in part, due to its advantage in being usable on (potato) fields during periods of heavy rains, cool soil temperatures, and cool wet weather.

(3) Effect of reducing conditions in soil and in groundwater on persistence of aldicarb residues. Several papers³⁻⁷ have recorded the ability of anaerobes (and even aerobes) to reduce sulfoxides to sulfides. Could aldicarb sulfoxide (or even aldicarb sulfone) be reduced to parent aldicarb thereby increasing its persistence? Should aldicarb not be used in fields that are swampy or flooded during part of the year? Are the low populations



Flow of contaminants in a water-table aquifer (humid region)
(Miller, 1977).

of microbes in groundwater able to reduce aldicarb sulfoxide (or the sulfone)? Would an iron reducing solution, Fe (II), or other naturally occurring reducers, be able to reduce aldicarb sulfoxide? Note that if an aqueous solution of ferrous iron does not reduce aldicarb sulfoxide (or sulfone), then this is not necessarily an indication that microbes will not reduce it.⁸

(4) How does pumping from wells modify path of movement of aldicarb in groundwater? Will pumping influence choice and location of monitoring wells?

(5) Are aldicarb residues in deep soil and water samples influenced directly or indirectly by exposure to air during sampling and storage?

(6) Is the sample storage method adequate? It is recommended that some groundwater and soil core samples be spiked with a known amount of aldicarb and put through the frozen storage method and analyzed a month later as would be the normal samples.

3.3 Verify the statement in the discussion of the [redacted] location that only 1% of the 257,029 acres planted to oranges in the 4 subject counties are treated with Temik.

REFERENCES

- (1) Haynes, R. J. 1981. Soil pH Decrease in the Herbicide Strip of Grassed-Down Orchards. Soil Sci. Vol. 132, No. 4, 274-278.
- (2) In: EAB evaluation of aldicarb on field corn (EPA Reg. No. 264-330 and 264-331) dated February 27, 1983; section 4.3.
- (3) Walter-Echols, G. and Lichtenstein, E. P. 1977. Microbial Reduction of Phorate Sulfoxide to Phorate in a Soil-Lake Mud-Water Microcosm. J. of Econ. Entomol. 70: 505-509.
- (4) Timms and MacRae, 1977. (reduction of fensulfothion to the sulfide). Applied and Environmental Microbiology; 34: 247-250.
- (5) Timms and MacRae, 1982. (reduction of fensulfothion to the sulfide). Aust. J. Biol. Sci.; 35: 661-667.
- (6) Zinder, S. H. and Brock, T. D., 1978. Dimethyl Sulfoxide Reduction by Micro-organisms. J. Gen. Microbiol. 105: 335-342.
- (7) De Bont, J. A. M., Van Dijken, J. P. and Harder, W., 1981. Dimethyl Sulfoxide and Dimethyl Sulfide as a Carbon, Sulfur and Energy Source for Growth of Hyphomicrobium S. J. Gen. Microbiol. 127: 315-323.
- (8) Letter from Dr. Martin Alexander of Cornell University to S. Creeger. July 29, 1983.

Samuel M. Creeger
August 30, 1983

Samuel M. Creeger Aug 30, 1983
Section #1/EAB/HED

PRIVACY ACT EXEMPTION

TO: WHOM IT MAY CONCERN:

This addendum review replaces the
earlier review of same dated Aug. 26, 1983.
The Aug. 26, 1983 version should be discarded.

Sam Creeger
August 30, 1983