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H E R B I C I D E O R A N G E
SITE MONITORING STUDIES
NCBC, GULFPORT MS

OVERVIEW

1. HISTORY OF NCBC
2. MONITORING OBLIGATIONS
3. MONITORING OBJECTIVES
4. DESCRIPTION OF INVENTORY
5. EARLY MONITORING STUDIES

H E R B I C I D E O R A N G E

OVERVIEW
(CONT)

6. PRESENT PROTOCOL

7. CONTRACTUAL EFFORTS

8. RESULTS

9. CONCLUSIONS

10. RECOMMENDATIONS

M O N I T O R I N G O B L I G A T I O N S

1. EPA OCEAN DUMPING PERMIT

2. AFLC PROGRAMMING PLAN 75-19

3. NAVY FACILITY

M O N I T O R I N G O B J E C T I V E S

1. DETERMINE AREA OF CONTAMINATION

2. DETERMINE FATE OF HERBICIDES/TCDD

3. MONITOR RESIDUE MOVEMENT

4. RECOMMEND SITE MANAGEMENT

H I S T O R Y O F N C B C

1. HERBICIDE AT NCBC - JUNE 1968
2. 15,400 DRUMS IN STORAGE - DECEMBER 1969
3. INVENTORY RE-WAREHOUSED - NOVEMBER 1972 AND AUGUST 1975
4. DRUM SURVEILLANCE - JANUARY 1973 - MAY 1977
5. PACER HO - JUNE 1977

D E S C R I P T I O N O F I N V E N T O R Y

1. ORANGE (13,855 DRUMS)

   NBE 2,4-D AND 2,4,5-T

2. ORANGE II (1,545 DRUMS)

   NBE 2,4-D AND IOE 2,4,5-T

3. MEAN TCDD - 2 PPM

   RANGE: .02 - 15 PPM

EARLY MONITORING STUDIES

1. AFATL, EGLIN AFB FL - 1970
2. EHL, KELLY AFB TX - 1972
3. DFCBS, USAF ACADEMY CO - 1974
4. ARL. WPAFB OH - 1976

WRIGHT STATE UNIVERSITY

- MINIMAL ENVIRONMENTAL IMPACT
- NO OFF-BASE DISCHARGE

P R E S E N T P R O T O C O L

12 SITES IN JULY 1977

42 SITES IN JANUARY 1978, NOVEMBER 1978

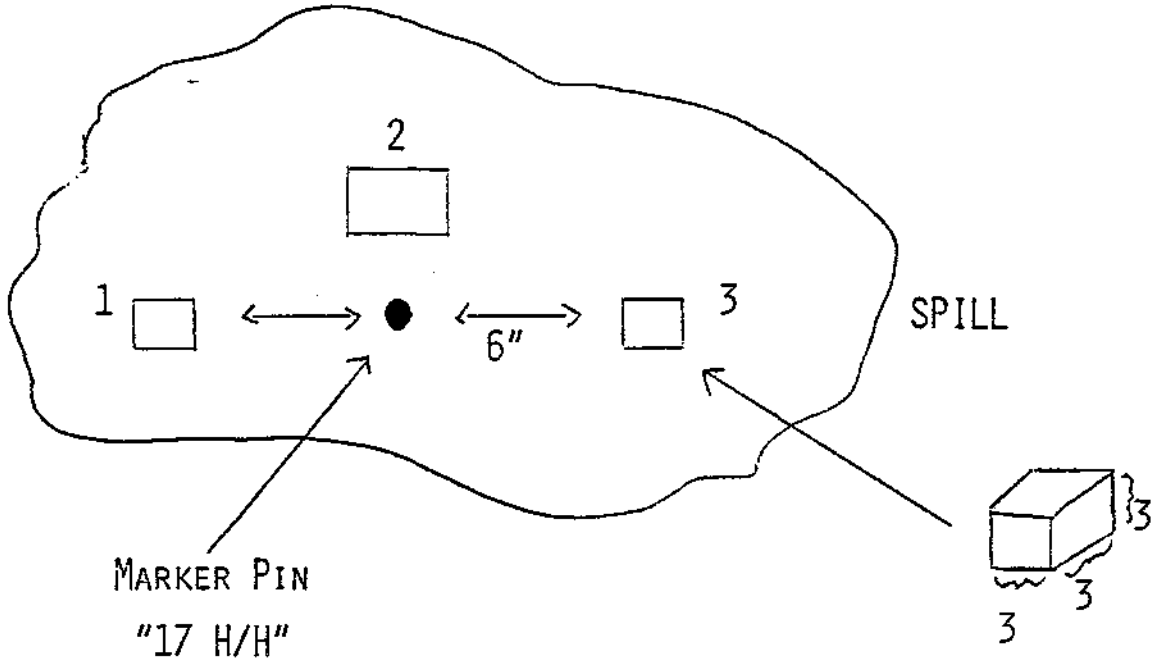
NEW SPILLS (H/H)

OLD SPILLS (L/L)

NO SPILL (O/O)

CONTROL SAMPLING SITE

SAMPLING TECHNIQUE



A N A L Y S E S

1. CHEMICAL

   ESTERS AND ACIDS 2,4-D AND 2,4,5-T

   DI-,TRICHLOROPHENOLS

   TCDD

2. MICROBIAL

   QUANTITATIVE

   QUALITATIVE

C O N T R A C T U A L E F F O R T S

UNIVERSITY OF UTAH

UNIVERSITY OF NEBRASKA

WASHINGTON STATE UNIVERSITY

IN-HOUSE: USAF ACADEMY
USAF SAM

ON-SITE RESULTS (PPM)

LOCATION		HERBICIDES	PHENOLS
O/O	JUL 77	14	0.3
	JAN 78	32	3.5
	NOV 78	3	0.4
L/L	JAN 78	1,200	86
	NOV 78	490	23
H/H	JUL 77	78,040	152
	JAN 78	51,280	437
	NOV 78	30,000	253

ON-SITE RESULTS

LOCATION	TCDD (PPM)
O/O	
JAN 78	ND (4)
L/L	
JAN 78	0.036 (3)
NOV 78	0.044 (3)
H/H	
JUL 77	0.237 (4)
JAN 78	0.206 (10)
NOV 78	0.144 (11)

ON-SITE - PENETRATION (SPILL)

	DEPTH	HERB (PPM)	PHENOL (PPM)	TCDD (PPM)
SURFACE	0-3"	61,650	365	0.325
ABOVE HARDPAN	3-6"	34,690	95	0.340
HARDPAN	6-9"	1,620	48	0.021

ON-SITE RESULTS - MICROBIAL

LOCATION		BACTERIA $x10^6$	FUNGI $x\ 10^6$
O/O			
	JUL 77	297	3
	JAN 78	456	0.8
	NOV 78	402	0.6
H/H			
	JUL 77	154	2.9
	JAN 78	494	0.7
	NOV 78	346	0.6
CONTROL		365	0.3

AQUATIC SAMPLING RESULTS - TCDD

	PARTS PER BILLION		
	WATER	SEDIMENTS	ORGANISMS
STORAGE AREA	ND	ND - 3.6	0.14 - 7.2
3000 FT	-	ND - 0.01	0.2 - 2.2
7000 FT	-	ND	0.045
9000 FT	-	ND - 0.02	0.02
12000 FT	-	NA	ND

ND - NOT DETECTED
NA - NOT ANALYZED

MAJOR CONCLUSIONS

1. 1-2 ACRES CONTAMINATED
2. HERBICIDES DECREASE RAPIDLY
3. TCDD SLOWLY DECRESING
4. PENETRATION OF HERBICIDE MINIMAL
5. PENETRATION OF TCDD NEGLIGIBLE

MAJOR CONCLUSIONS (CONT)

6. SOIL STERILIZATION DID NOT OCCUR
7. MICROORGANISMS INCREASED
8. MOVEMENT OF TCDD VIA EROSION
9. BIOLOGICALS CONTAIN TCDD
10. TCDD DETECTED OFF-BASE

RECOMMENDATIONS

1. LEAVE STORAGE AREA UNDISTRUBED
2. LIMIT ACCESS TO STORAGE AREA
3. STABILIZE DITCH BANKS
4. CONSTRUCT SILT CATCHMENTS
5. CONSTRUCT RETAIN POND
6. INITIATE RESEARCH EFFORT
7. INITIATE DECONTAMINATION STUDIES

YOUNG

HERBICIDE ORANGE

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NCBC, GULFPORT MS

OVERVIEW

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HERBICIDE ORANGE

OVERVIEW

(CONT)

6. PRESENT PROTOCOL
7. CONTRACTUAL EFFORTS
8. RESULTS
9. CONCLUSIONS
10. RECOMMENDATIONS

HISTORY OF NCBC

HARD PAN — 1940s

1. HERBICIDE AT NCBC - JUNE 1968

55 gallon Drums

2. 15,400 DRUMS IN STORAGE - DECEMBER 1969

3. INVENTORY RE-WAREHOUSED - NOVEMBER 1972 AND AUGUST 1975

4. DRUM SURVEILLANCE - JANUARY 1973 - MAY 1977

5. PACER HO - JUNE 1977

MONITORING OBLIGATIONS

1. EPA OCEAN DUMPING PERMIT

2. AFLC PROGRAMMING PLAN 75-19

3. NAVY FACILITY

MONITORING OBJECTIVES

1. DETERMINE AREA OF CONTAMINATION

2. DETERMINE FATE OF HERBICIDES/TCDD

3. MONITOR RESIDUE MOVEMENT

4. RECOMMEND SITE MANAGEMENT

DESCRIPTION OF INVENTORY

1. ORANGE (13,855 DRUMS)

   NBE 2,4-D AND 2,4,5-T

2. ORANGE II (1,545 DRUMS)

   NBE 2,4-D AND IOE 2,4,5-T

3. MEAN TCDD - 2 PPM

   RANGE: ND - 15 ppm

EARLY MONITORING STUDIES

Earliest Observation

1. AFATL, EGLIN AFB FL -1970
2. EHL, KELLY AFB TX -1972 - through 1976 and is currently continuous as OEHL
3. DFCBS, USAF ACADEMY CO -1974
4. ARL, WPAFB OH -1976

WRIGHT STATE UNIVERSITY

- MINIMAL ENVIRONMENTAL IMPACT
- NO OFF-BASE DISCHARGE

PRESENT PROTOCOL

Spills were discernible by sight and by smell

12 SITES IN JULY 1977

42 SITES IN JANUARY 1978, NOVEMBER 1978

NEW SPILLS (H/H) heavy stain/ strong oder

OLD SPILLS (L/L) light stain / mild oder

NO SPILLS (0/0) no stain/no oder

CONTROL SAMPLING SITE

EARLY Studies indicated 95% of residue in top 3inches

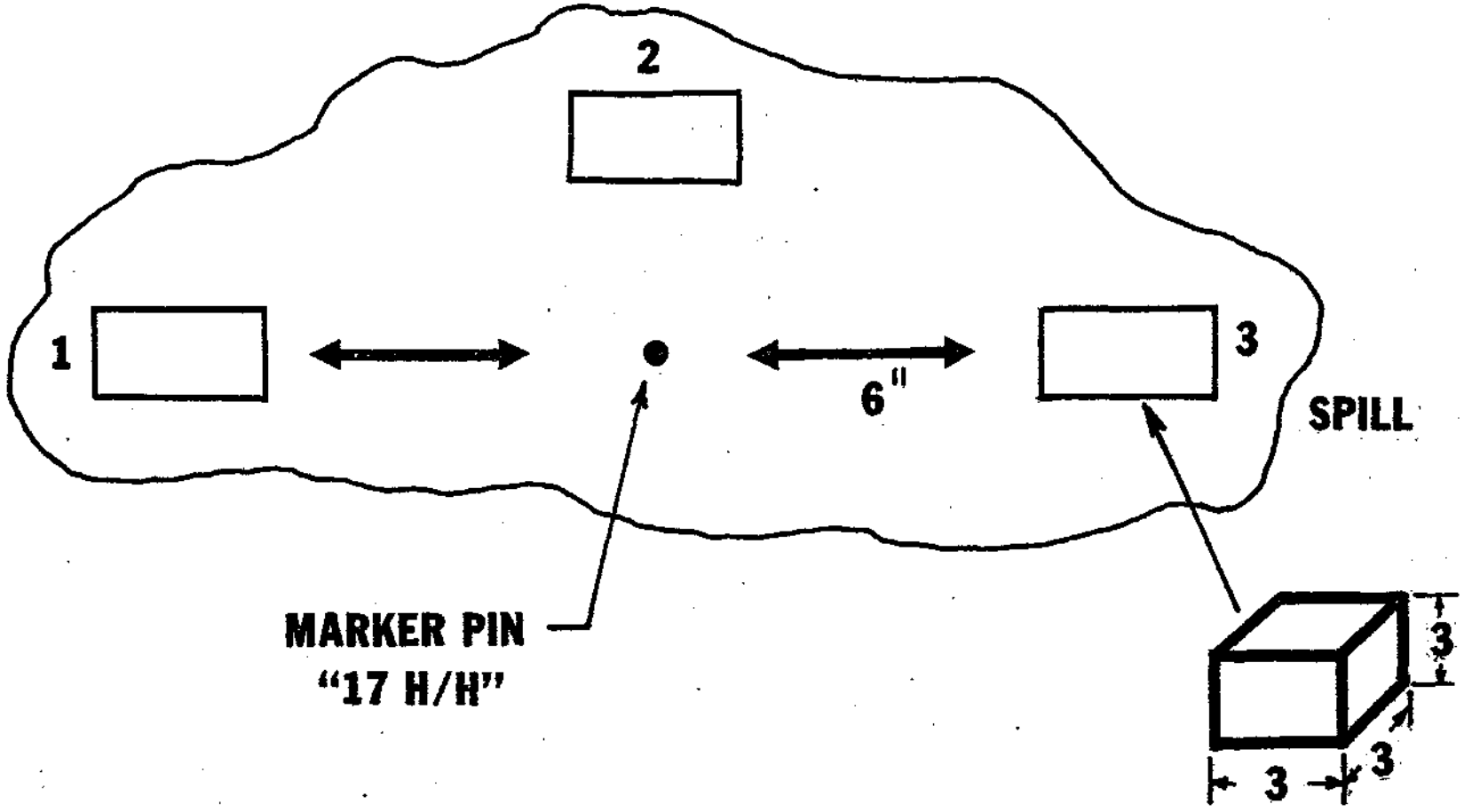
(1) delineation of SITES

(2) placing of permanent MARKER pin

(3) At each sampling date, SOIL was removed from a different point of the compass. This insured a fresh and undisturbed profile each time

(4) 3 inch cube removed & mixed & subsampled.

SAMPLING TECHNIQUE



ANALYSES

1. CHEMICAL

   ESTERS AND ACIDS 2,4-D AND 2,4,5-T

   DI-, TRICHLOROPHENOLS

   TCDD

2. MICROBIAL

   QUANTITATIVE

   QUALITATIVE

CONTRACTUAL EFFORTS

UNIVERSITY OF UTAH - Herbicides, Phenols & Soil TCDD

UNIVERSITY OF NEBRASKA - High Resolution analyses for TCDD

WASHINGTON STATE UNIVERSITY - Orange Degradation Studies

IN-HOUSE: USAF ACADEMY - Microbial

USAFSAM - Isooctyl

USAF OEHL - Water

Delineation of a sampling site by sight and smell validated.

(1) Statistically significant decrease in the levels of total herbicides and total phenols was found to occur between the two dates.

ON - SITE RESULTS (PPM)

(2) 2/3 degradation in 18 months.

LOCATION	HERBICIDES	PHENOLS
O/O		
JUL 77	14	0.3
JAN 78	32	3.5
NOV 78	3	0.4
L/L		
JAN 78	1,200	86
NOV 78	490	23
H/H		
JUL 77	78,040	152
JAN 78	51,280	437
NOV 78	30,000	253

2 locations → 150 acyls present

① There was a downward trend in TCDD levels but not stat. significant

ON - SITE RESULTS

LOCATION		TCDD (PPM)	
O/O			
	JAN 78	ND	(4)
L/L			
	JAN 78	0.036	(3)
	NOV 78	0.044	(3)
H/H			
	JUL 77	0.237	(4)
	JAN 78	0.206	(10)
	NOV 78	0.144	(11)

Two trend not pronounced with 1977 data but ~~77~~ 77 & ~~78~~ 78 sites are not paired & cannot be statistically compared

(1) This core collected from the heart of Spill site -
(2) It was collected in JUN 1979 (2 years from PACER HO)

ON - SITE — PENETRATION (SPILL)

(3) A decrease in concentration of residues occured with depth.
(4) The hardpan appeared essentially impervious to residue.

	DEPTH	HERB (PPM)	PHENOL (PPM)	TCDD (PPM)
SURFACE	0-3"	61,650	365	0.325
ABOVE HARDPAN	3-6"	34,690	95	0.340
HARDPAN	6-9"	1,620	48	0.021
HARDPAN	9 - 15"	322	11	ND (<0.007)

① biological activity high –
② Some trends are discernible
③ three-fold increase in H/H with time

ON - SITE RESULTS - MICROBIAL

LOCATION	BACTERIA x10^6	FUNGI x10^6	
O/O			
JUL 77	297	3	
JAN 78	456	0.8	
NOV 78	402	0.6	
H/H			
JUL 77	154	2.9	} 4 fungal genera
JAN 78	494	0.7	
NOV 78	346	0.6	
			only 2 same
CONTROL	365 (Colony forming Units)	0.3	13 fungal genera

One Sample of TCDD - 1976 - Sample never validated

36 Potable
61 Surface Samples } TCDD

AQUATIC SAMPLING RESULTS - TCDD

	PARTS PER BILLION		
	WATER	SEDIMENTS	ORGANISMS
STORAGE AREA	ND	ND - 3.6	0.14 - 7.2
3000 FT	-	ND - 0.01	0.2 - 2.2
7000 FT	-	ND	0.045
9000 FT	-	ND - 0.02	0.02
12000 FT	-	ND	ND

ND - NOT DETECTED

MAJOR CONCLUSIONS

1. 1-2 ACRES CONTAMINATED
2. HERBICIDES DECREASE RAPIDLY
3. TCDD SLOWLY DECREASING
4. PENETRATION OF HERBICIDE MINIMAL
5. PENETRATION OF TCDD NEGLIGIBLE

MAJOR CONCLUSIONS

(CONT)

6. SOIL STERILIZATION DID NOT OCCUR
7. MICROORGANISMS INCREASED
8. MOVEMENT OF TCDD VIA EROSION
9. BIOLOGICALS CONTAIN TCDD
10. TCDD DETECTED OFF-BASE

RECOMMENDATIONS

1. **LEAVE STORAGE AREA UNDISTURBED** – To cover area would prevent further degradation.

a. 2. **LIMIT ACCESS TO STORAGE AREA**

b. 3. **STABILIZE DITCH BANKS**

c. 4. **CONSTRUCT SILT CATCHMENTS**

d. 5. **CONSTRUCT RETAINING POND**

6. **INITIATE RESEARCH EFFORT** – Effort will tell us definitively what is happening?

1. Continue effort to follow movement of impact – i.e. Biological Effect.

2. Decontamination procedures for those contaminated sites.

RECOMMENDATIONS

LEAVE STORAGE AREA UNDISTURBED

A. LIMIT ACCESS TO STORAGE AREA

B. STABILIZE DITCH BANKS

C. CONSTRUCT SILT CATCHMENTS

D. CONSTRUCT RETAINING POND

E. DEVELOP A RESEARCH PROTOCOL

RECOMMENDATIONS

LEAVE STORAGE AREA UNDISTURBED

A. LIMIT ACCESS TO STORAGE AREA

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