

Sampling Protocol

Per. memo from T.J. Hoogheem.

To: Samplers

From: Thomas J. Hoogheem, Monsanto Co, St. Louis, Mo.
Phone (314) 694-5742

Subject: Soil Coring Protocol

The protocol is as follows:

1. Wash out inside of all tubes with soap and water.
 2. Place driving cap on to top of coring tube, place on sampling point, and drive to within 2-4 inches of tube top.
 3. Measure depth of soil from top of tube both inside and outside tube to determine soil compaction.
 4. Remove driving cap, push rod through holes on tube and turn tube clockwise 2 complete turns.
 5. Again using rod, pull tube completely out of hole.
 6. Push packing wrap into top of tube to keep soil core in tact.
 7. Tape ends of tubes with duct tape.
 8. Place label on tube.
 9. Place tube back into shipping container.
 10. Send Shipping container to:
Monsanto Research Corp
1515 Nicholas Rd
Dayton Ohio 45407
Attn Roy Noble
- Send via Federal Express or other overnight carrier.



11. Call T.J. Hoogheem ((314) 694 5742) if any questions before, during or after sampling.
or Call J.M. Schroy ((314) 694-6174).
12. Equipment list.

5 - 14" split tube samplers
 3 - 26" split tube samplers
 Rod.
 Cap
 Tape
 labels
 Cleaning brush
 Packing paper.
 Plastic bags.
 Sledge hammer.
 14" Pipe wrench.
 Shipping Container.

Sampling Sites

1. Nonamended Biodegradation Site
 - 2 - 14" tubes
 - 1 - 26" Tubes
2. Carbon Amended Biodegradation Site
 - 1 - 14" tubes
 - 1 - 26" tube
3. Amended Plot
 - 1 - 14" tube
 - 1 - 26" tube
4. Spray Area
 - 1 - 14" tube

Eglin AFB Sampling Effort 10 Feb 1984

Alvin Young, Thomas J. Hoogheem, J.M. Schroy and John Woolsey visited the Biodegradation plots established in the early 1970's to sample them. Photo's were taken of the site and all sampling efforts.

The sample plot boundaries were reestablished based on the markers left previously. The carbon amended plot provided the best method to fix plot configuration and boundaries.

Photo's taken

1. Pictures of test range from control tower - into sun.
2. Site at first encounter with weights signs & Markers.
3. Reestablishing plots - Digging facing and taking samples.
4. Evidence of animal life in area around plots.
5. Pictures of trenches showing carbon plots
6. Photos of Biodegradation plots following sampling
7. Photos of Access road to Spray area
8. Photos of Grid 1 Spray area.
9. Photos of Sampling at spray area.
10. Photos of spray area from local service tower to match 1970's photos.

I Sampling of Eglin AFB 10 Feb 1984.

All directions based on looking from access road.

Sample Set 1 Carbon Depth Below Surface = 5" (see photo's)

1. Carbon Amended Plot - Plot 10 (Plowed, fertilizer lime and organic matter)

✓ a) EGL-1C Center trench 4 1/2' to 5' from plot edge on rt.
2" compaction out of 24 1/2" (original 300 ppt)

✓ b) EGL-2C left trench 8' to 9' from plot edge on rt.
1" compaction out of 13"

— c) EGL-3C No sample.

Sample Set 2

2. Amended Plot - Plot # 8 (plowed, fert lime & organic matter)

✓ a) EGL-6A Left trench 8'-9' from plot edge on right.
3/4" compaction out of 12 1/2"

✓ b) EGL-8A Center trench 4' to 5' from plot edge on rt.
2 1/2" compaction out of 24"

Sample Set 3

3. Non amended Plot - Plot # 5 (plowed + herbicide)

✓ a) EGL 4N Center Trench 4' to 5' from plot edge on rt.
3/4" compaction out of 12 1/2"

✓ b) EGL - 5N Right trench 1' to 2' from plot edge on rt.
4 1/2" compaction out of 25"

✓ c) EGL - 7N Left Plot 8' to 9' from plot edge on right
3/4" compaction out of 13"

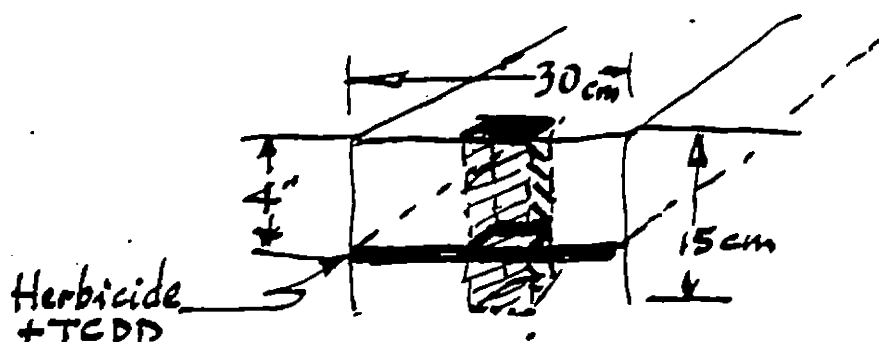
Sample Set 4

✓ 4. EGN-9S Center of Grid 1 Spray Area
1" compaction out of 13"

Edlin AFB.
Capt. Terry Stoddard
AF ESC/RDV
Tyndall AFB
Panama City, Florida 32403.

Plot 5, Eglin AFB Soil Biodegradation Study

Data per Alvin L. Young 9 April 84



Remember

The technique involved removing the top 4 inches (10 cm) of soil; leveling the 30 cm wide trench and then spraying with the herbicide. We carefully covered the trench and after 5 days collected our samples. (15 cm increment remove(d) 5 days after spraying zone with agent orange.) The first sample were collected using a soil auger (in 1972), but later samples were collected by trenching and sampling the exposed surface. After the 15 cm increment was collected it was carefully mixed; thus the value recorded represents the concentration of the 15 cm increment.

Days after Application	Concentration, ppt	Comments
5	375	} these values determined by Dow Chemical, USA in 1972-1973
414	250	
513	75	} Determined by Air force (extraction questioned)
707	46	

I (Alvin Young) would estimate the herbicide formed a 1 cm band and thus probably contained on day 5 a concentration of about 5.6 ppb TCDD ($15 \text{ cm} \times 375 \text{ ppt/cm}$)

JMS
microtopes
1-1-84

Volume of herbicide sprayed?

G18870

Initial Results of Sample 4N (Plots - Nonamended biodegradation plot.), 5N and 7N

Depth, inches	Core increment TCDD concentration, ppt		
	4N	5N	7N
0-1	ND (0.12)	ND (0.07)	0.43
1-2	0.08	ND (0.1)	ND (0.19)
2-3	0.25	0.45	ND (0.23)
3-4	0.43	0.86	0.43
4-5	ND (0.2)	0.65	ND (0.11)
5-6	ND (0.06) (0.05)	0.23, 0.24	ND (0.12)
6-7	ND (0.10)	0.12	ND (0.07)
7-8	ND (0.04)	ND (0.07)	ND (0.04)
8-9	contaminated*	ND (0.07)	ND (0.04)
9-10	ND (0.04)	ND (0.04)	ND (0.04)
10-11	ND (0.13)	ND (0.04)	ND (0.04)
11-12	ND (0.08) (0.14)	ND (0.04) (0.04)	ND (0.05)
12-13	ND (0.4)	ND (0.04)	ND (0.04)
13-14		ND (0.04)	
14-15		ND (0.04)	
15-16		ND (0.04)	
16-17		ND (0.04)	
17-18		ND (0.04)	
18-19		ND (0.04)	
19-20		ND (0.04)	
20-21		contaminated*	
21-22			
22-23			
23-24			

* Sample contaminated during lab work

** ND () Not detectable at level stated in bracket.

Results of the high resolution mass spec analyses of core 4N; 5N & 7N *

Depth, inches	Core increment TCDD concentration, ppt		
	4N	5N	7N
0-1	24-27	29	92
1-2	57	70	57
2-3	239	346	11
3-4	321 & 310 [†]	785	264
4-5	68	582	28,29
5-6	15 & 11	185,200	8
6-7	5	73	4
7-8	Contaminated*	22	3
8-9	Contaminated*	19	6
9-10	Contaminated*	8	7
10-11	ND(3)	8	1,2
11-12	ND(3)	3,3	2
12-13		3	
13-14		ND(1)	
14-15		2	
15-16		ND(1)	
16-17		ND(1)	
17-18		ND(1)	
18-19		ND(1)	
19-20		ND(1)	
20-21			
21-22			
22-23			
23-24			

0198r

† 310 Based on 894 spiked sample result of 1204 (12)

* Sample contaminated during lab work

** ND() Not detected at level stated in brace
limit due to contamination at 0.37 ppb

Comparison of high resolution and low resolution results for sample 4N.

Depth in	low resolution ppt	High resolution ppt
0-1	ND(120)	24-27
1-2	80	57
2-3	250	239
3-4	430	321, 310*
4-5	ND(200)	68
5-6	ND(50-60)	11-15
6-7	ND(110)	5
7-8	ND(40)	Contaminated**
8-9	Contaminated	"**
9-10	ND(40)	"**
10-11	ND(130)	ND(3)
11-12	ND(80-140)	-
12-13	ND(400)	-

ND(xx) = Not detected at xx detection limit.

* Spiked w/ 894 ppt found 1204. $1204 - 894 = 310$

** Reanalysis of sample showed analytical protocol was not functional.

Ground Temperature below surface
at stable point

Florida in and around Eglin AFB
Okalusa County water supply data

Niceville $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Crestwood $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Ft. Walton $27^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Temperature of ground water in flowing
aquifer at 500 ft to 900 ft below
the surface

Surface water 5-7 ft below surface
is 75°F .

Data per Jeff Watts at Florida EPA
Bureau of Ground water (904) 488-3601

Data addition on Eglin

Alvin Young meeting 3:50 PM to 5:25 PM 27 June 84

1. Analytical problems with doing 2,4,5 trichlorophenoxy acetic acid ester analyses was discussed. A paper on the octyl ester of trichlorophenol as a contaminant that gave problems in early Eglin analytical work.
2. The analysis of present Eglin conditions must include a material balance on TCDD. What was the liquid loading on each trench? And what was TCDD level in the liquid?

TCDD = 0.04 ppm or 4×10^{-8} gm/gm
the trenches were loaded with
950 ml of Agent orange per 10 square
feet of trench surface.

This was equivalent to 0.2675 lbs Agent
orange per sq. ft.

$$0.2675 \times 453.59 = 121.335 \text{ gm/ft}^2$$

TCDD

$$121.335 \text{ gm} \times 4 \times 10^{-8} = 4.8534 \times 10^{-6} \text{ gm/ft}^2$$

For 15" (1.25 ft) Deep core

$$4.8534 \times 10^{-6} \text{ gm/ft}^2 / 1.25 \text{ ft} = 3.8827 \times 10^{-6} \text{ gm/ft}^3$$

At 100 lb/cf (45359 gm/ft³)

$$3.8827 \times 10^{-6} \text{ gm/ft}^3 / 45359 \text{ gm/ft}^3$$

$$= 8.56 \times 10^{-11} \text{ gm/gm}$$

$$85.6 \text{ ppt}$$

Miscellaneous Data

1. Hill AFB involved use of Agent Orange Z from Thomas Hayward at 3.7 ppm.

2. A check of loading

Soil weight

45359 gm/ft² or 3779.917 gm/ft² in

TCD

Core 4N, gm/gm soil

$$24.5 \times 10^{-12} \times 3779.917 = 92.608 \times 10^{-9} \text{ gm/ft}^2$$

$$57 \times 10^{-12} \times " = 215.645 \times 10^{-9}$$

$$259 \times 10^{-12} \times " = 1192.564 \times 10^{-9}$$

$$315.5 \times 10^{-12} \times " = 1192.564 \times 10^{-9}$$

$$68 \times 10^{-12} \times " = 257.634 \times 10^{-9}$$

$$13 \times 10^{-12} \times " = 49.139 \times 10^{-9}$$

$$5 \times 10^{-12} \times " = 18.900 \times 10^{-9}$$

$$\underline{1.752 \times 10^{-6} \text{ gm/ft}^2}$$

Core 5N

$$450 \times 10^{-12} \times 3779.917 = 1.70096 \times 10^{-6} \text{ gm/ft}^2$$

$$860 \times 10^{-12} \times " = 3.25072 \times 10^{-6}$$

$$650 \times 10^{-12} \times " = 2.45695 \times 10^{-6}$$

$$230.5 \times 10^{-12} \times " = 0.87127 \times 10^{-6}$$

$$120 \times 10^{-12} \times " = 0.45359 \times 10^{-6}$$

$$\underline{8.73349 \times 10^{-6} \text{ gm/ft}^2}$$

This compares to $4.85 \times 10^{-6} \text{ gm/ft}^2$ very poorly implying the variation in applying the 950 ml over 10 ft² was very erratic. Each sample can be expected to be very different making retrospective analysis

-1
 -2
 -3
 -4
 -5
 -6
 -7
 -8
 -9
 -10
 -11
 -12
 -13
 -14
 -15
 -16

5N	10^6 gm/ft^2	6A	10^4 gm/ft^2	7N	10^6 gm/ft^2
29 ppt	0.180	5	0.019	92	0.348
70	0.265	26	0.098	57	0.215
346 pp	1.308	46	0.174	11	0.042
785 p1	2.967	97	0.367	264	0.998
582	2.200	253	0.956	28,29	0.108
185, 200	0.747	299	1.130	8	0.030
73	0.276	26,51	0.144	4	0.015
22	0.083	8	0.030	3	0.011
19	0.072	7	0.026	6	0.023
8	0.030	4	0.015	7	0.026
8	0.030	3	0.011	1, 2	
3, 3	0.011	2	0.008	1	
3	0.011	1		2	
ND (1)	0.076		2.978		1.816
2	0.076				
ND (1)					
	8.118				



78.5 ppt	$1.752 \times 10^{-6} \text{ gm/ft}^2$	4N
391. ppt	$8.733 \times 10^{-6} \text{ gm/ft}^2$ $8.118 \times$	5N
85.6 ppt	$4.853 \times 10^{-6} \text{ gm/ft}^2$	Loading Basis.
375 ppt	$8.371 \times 10^{-6} \text{ gm/ft}^2$	5 Days
250 ppt	$5.581 \times 10^{-6} \text{ gm/ft}^2$	414 Days
75 ppt	$1.674 \times 10^{-6} \text{ gm/ft}^2$	513 Days - ☐
46 ppt	$1.027 \times 10^{-6} \text{ gm/ft}^2$	707 Days - ☐
	$2.978 \times 10^{-6} \text{ gm/ft}^2$	6A
	$1.816 \times 10^{-6} \text{ gm/ft}^2$	7N

Results of the high resolution mass spec analyses of core ~~6A~~, 8A, 1C & 2C

Depth, inches	Core increment TCO concentration, ppt.				
	6A	8A	9S	1C	2C
0-1	5	8	461	40	9
1-2	26	8	661,972	114	28
2-3	46	84	1040	108	50
3-4	97	55	3712	23	41
4-5	253	15	1838,1783	?*	?*
5-6	299	5,3	397	11,12	106, ND(8)
6-7	26,51	3	140	4	ND(1)
7-8	8	2	27	2	ND(1)
8-9	7	4	20	ND(1)	3
9-10	4	8	14	ND(4)	2
10-11	3	21	6	12	ND(1)
11-12	2	2,3	3	19,13	1,3
12-13	1	ND(<1)	?	13	
13-14		ND(<1)		10	
14-15		?		10	
15-16		?		ND(<1)	
16-17		ND(<1)		ND(<1)	
>17		ND(<1)		ND(<1)	

? = Analytical protocol failed due to insufficient recovery.

* Carbon tayer at this depth