SP
Aroclor

Monsanto INDUSTRIAL CHEMICALS CO.

FROM (NAME & LOCATION) E. S. Tucker - T2F

DATE : December 6, 1972

SUBJECT

REFERENCE : W. M. Mees Memo to W. B. Papageorge - 10/10/72

TO : W. B. Papageorge
B2NA

cc: J. D. Hinchen - R3B
R. E. Keller - T1B
W. M. Mees - T2F
R. H. Munch - T1B
W. R. Richard - T3A
E. P. Wheeler/P. Wright - A3SA

Attached to this memo are all the PCB tissue residue data we have for Aroclor 1242, Aroclor 1254, and Aroclor 1260. These are the data used to prepare the PCB Task Force report and which Drs. Mehlman and Van Loon of the FDA want to review in detail when they visit St. Louis December 20th.

As requested, I have reserved a conference room, R-452, for our informal discussions starting at 9:00 A.M. The appropriate Applied Sciences people have been contacted (Hinchen, Mees and myself) and plan to attend.

E. S. Tucker

db
Attachment

DSW 362440

STLCOPCB4098212

TABLE XIII

19 30-Day Tissue Collection Study in Albino Rats with Aroclors

ppm PCB in Rat Tissues (Wet Weight Basis)

Material	Tissue	30 Day Sacrifice				Sacrifice
		300 ppm		1000 ppm		Exposure Level
		♂	♀	♂	♀	Sex
Aroclor 1242	Muscle	5	12	17	29	
	Kidney	1	2	5	2	
	Liver	3	5	10	17	
	Fat	—	276	377	412	
Aroclor 1254	Muscle	56	36	271	167	
	Kidney	8	13	47	156	
	Liver	57	54	176	227	
	Fat	695	660	4660	3430	
Aroclor 1260	Muscle	82	136	266	555	
	Kidney	29	16	72	91	
	Liver	126	125	200	206	
	Fat	2130	2035	9190	11970	

DSW 362441

STLCOPCB4098213

TABLE XIV

IBT #B7009 30 Day Tissue Collection Study in Albino Rats with Aroclors

ppm PCB in Rat Tissues (Lipid Weight Basis)

Material	Tissue	30 Day Sacrifice				Sacrifice
		300 ppm		1000 ppm		Exposure Level
		♂	♀	♂	♀	Sex
Aroclor 1242	Muscle	37	58	736	855	
	Kidney	12	28	276	146	
	Liver	61	220	753	793	
	Fat	—	395	816	722	
Aroclor 1254	Muscle	1396	1274	7735	6202	
	Kidney	655	1895	3325	12972	
	Liver	2370	3358	5318	6678	
	Fat	1094	1289	7203	7544	
Aroclor 1260	Muscle	2470	4849	8879	24111	
	Kidney	2056	2671	5181	7579	
	Liver	3808	6226	6263	10300	
	Fat	3061	3430	13715	19088	

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STLCOPCB4098214

TABLE XV

IBT #B7009 30 Day Tissue Collection Study in Albino Rats with Aroclors

Predicted ppm PCB in Rat Tissues (Lipid Weight Basis)

Material	Tissue	30 Day Sacrifice				Sacrifice
		300 ppm		1000 ppm		Exposure Level
		♂	♀	♂	♀	Sex
Aroclor 1242	Muscle	44	83	608	821	
	Liver	105	199	765	1033	
	Fat	105	199	765	1033	
Aroclor 1254	Muscle	721	1239	5602	6859	
	Liver	1145	1997	4694	5748	
	Fat	1145	1997	4694	5748	
Aroclor 1260	Muscle	2921	4779	17004	19823	
	Liver	3784	6190	11630	13557	
	Fat	3784	6190	11630	13557	

Regression Equation - log ppm PCB = $-0.9861 - 0.2309$ (if muscle) $+ 0.1855$ (% Cl_2) $+ 0.3329$ (log ppm fed) $+ 0.1124$ (if female) $+ 0.1471$ (% Cl_2 if muscle) $+ 0.5306$ (log ppm fed if muscle) $- 0.3994$ (log ppm fed x % Cl_2) $- 0.3552$ (% Cl_2 if female) $- 0.2815$

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STLCOPCB4098215

TABLE XVI

IBT # B7298 Two-Year Chronic Oral Toxicity Study of Aroclor in Albino Rats

ppm PCB in Rat Tissues (Wet Weight Basis)

Material	Tissue	1 ppm			10 ppm			100 ppm			Exposure Level
		3 mo.	12 mo.	24 mo.	3 mo.	12 mo.	24 mo.	3 mo.	12 mo.	24 mo.	Sacrifice
Aroclor 1242	Muscle	0.7	1	1.8	1.4	6	14	5	33	73	
	Liver	0.1	0.2	0.5	0.2	0.6	1	0.9	5	5	
	Fat	6	7	6	12	30	43	60	144	220	
Aroclor 1254	Muscle	2	2	13	8	131	98	46	94	352	
	Liver	0.1	0.4	1.2	1	23	6	15	24	133	
	Fat	6	19	45	75	632	315	1208	794	1533	
Aroclor 1260	Muscle	6	8	15	8	50	116	10	419	785	
	Liver	0.2	1	0.8	2	3	5	18	53	107	
	Fat	28	56	50	417	224	298	482	2000	4447	

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STLCOPCB4098216

TABLE XVII

IBT # B7298 Two-Year Chronic Oral Toxicity Study of Aroclor in Albino Rats

ppm PCB in Rat Tissues (Lipid Weight Basis)

Material	Tissue	1 ppm			10 ppm			100 ppm			Exposure Level
		3 mo.	12 mo	24 mo.	3 mo.	12 mo.	24 mo.	3 mo	12 mo.	24 mo.	Sacrifice
Aroclor 1242	Muscle	8	6	5	16	38	74	76	236	239	
	Liver	11	16	18	26	40	52	77	241	234	
	Fat	6	8	9	13	32	47	67	151	227	
Aroclor 1254	Muscle	10	11	38	96	721 (196)	389	756 (800)	1092	2164	
	Liver	18	24	82	115	914 (292)	307	1137 (2000)	869	1810 (4800)	
	Fat	6	19	55	76	688 (231)	348	329 (900)	860	1894	
Aroclor 1260	Muscle	16	47	44	60	259	436	146 (689)	2247	5154	
	Liver	20	50	56	102	189	442	1677	1752	6310	
	Fat	32	60	62	138	262	354	866	2143	5060	

( ) – Smoothed data, used to develop second regression equation

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TABLE XVIII

IBT #B7298 Two Year Chronic Oral Toxicity Study of Aroclor in Albino Rats

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Predicted ppm PCB in Rat Tissues (Lipid Weight Basis)

Material	Tissue	1 ppm			10 ppm			100 ppm			Exposure Level
		3 mo	12 mo	24 mo	3 mo	12 mo	24 mo	3 mo	12 mo	24 mo	Sacrifice
Aroclor 1242	Muscle	5	8	10	20	32	45	77	133	206	
	Liver	8	12	15	30	48	68	115	199	307	
	Fat	5	8	10	20	32	45	77	133	206	
Aroclor 1254	Muscle	11	21	36	81	163	305	584	1264	2611	
	Liver	17	31	53	121	242	455	870	1884	3893	
	Fat	11	21	36	81	163	305	584	1264	2611	
Aroclor 1260	Muscle	16	30	51	116	234	439	840	1819	3758	
	Liver	19	36	62	140	281	527	1008	2182	4509	
	Fat	20	38	65	147	296	554	1061	2297	4746	

Regression Equation $\log \text{ppm PCB} = 3.3550 - 1.3440 (\text{if } 1242) - 0.3696 (\text{if } 1254) + 0.2881 (\text{if liver}) + 0.8936 (\log \text{ppm fed}) + 0.0626 (\text{time} - 12) - 0.2761 (\log \text{ppm fed if } 1242) - 0.0246 (\text{time} - 12 \text{ if } 1242)$

TABLE XIX

IBT #P7297 Three-Generation Reproduction Study in Albino Rats with Aroclor

ppm PCB in Rat Pups (Wet Weight Basis)

	21 Day Sacrifice			Sacrifice
Material	1 ppm	10 ppm	100 ppm	Exposue Level
Aroclor 1242	0.2	4	32	
Aroclor 1254	2	16	155	
Aroclor 1260	1	8	104	

ppm PCB in Rat Pups (Lipid Weight Basis)

	21 Day Sacrifice			Sacrifice
Material	1 ppm	10 ppm	100 ppm	Exposure Level
Aroclor 1242	67	78	578	
Aroclor 1254	48	170	2328	
Aroclor 1260	21	213	2371	

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TABLE XXIII

IBT # C7299 Two-Year Chronic Oral Toxicity Study of Aroclor in Beagle Dogs

ppm PCB in Dog Tissues (Wet Weight Basis)

Material	Tissue	1 ppm						10 ppm						100 ppm						Exposure Level
		24 mo.		30 d.		60 d.		24 mo.		30 d.		60 d.		24 mo.		30 d.		60 d.		Sacrifice
		♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	Sex
Aroclor 1242	Muscle	0.07	0.08	0.09	0.06			0.3	0.2		0.2		0.04	0.6	0.5	0.3	0.4	0.5		
	Liver		0.08	0.3	0.04		0.04	0.2	0.1		0.1	0.05		0.6		0.4	0.3			
	Fat	2	2	1	0.5	0.5		1	1		2	1	2	4	4	9	2			
Aroclor 1254	Muscle	0.3	0.08	0.2		0.1	0.1	0.7	0.3		0.7			4	3				3	
	Liver	0.1	0.2		0.2			0.4	0.7			0.5		2	2	1				
	Fat	4	3	2			2	5	4		18			95	73				34	
Aroclor 1260	Muscle	0.2	0.4		1		0.2	1	0.4		6		3	26	10		34	26		
	Liver	0.2	0.1	0.1			0.3	2	0.7	2	1	0.9	1	11	4		2	9		
	Fat	11	14		14		4	101	31	40	47		62	93	221		352	173		

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TABLE XXIV

IBT #C7299 Two-Year Chronic Oral Toxicity Study of Aroclor in Beagle Dogs

ppm PCB in Dog Tissues (Lipid Weight Basis)

Material	Tissue	1 ppm						10 ppm						100 ppm						Exposure Level
		24 mo.		30 d.		60 d.		24 mo.		30 d.		60 d.		24 mo.		30 d.		60 d.		Sacrifice
		♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	Sex
Aroclor 1242	Muscle	2	2	1	2			6	3		2		1	19	20	10	10	6		
	Liver		4	11	2		2	8	8		9	4		29		23	18			
	Fat	2	3	1	1	0.6		1	2		2	2	2	6	7	13	3			
Aroclor 1254	Muscle	10	4	4		2	2	18	18		9			61	95				32	
	Liver	8	6		9			23	40			43		110	130	111				
	Fat	5	3	3			2	6	10		22			128	132				42	
Aroclor 1260	Muscle	9	7		8		3	78	20		66		37	796	100		491	301		
	Liver	17	13	11			21	175	43	112	135	55	120	762	268		81	659		
	Fat	14	18		20		5	159	39	54	72		78	1261	287		439	238		

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TABLE XXV

IBT #C7299 Two-Year Chronic Oral Toxicity Study of Aroclor in Beagle Dogs

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Predicted ppm PCB in Dog Tissues (Lipid Weight Basis)

Material	Tissue	1 ppm						10 ppm						100 ppm						Exposure Level
		24 mo		30 d.		60 d.		24 mo.		30 d.		60 d.		24 mo.		30 d.		60 d.		Sacrifice
		♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	Sex
Aroclor 1242	Muscle	2	2	1	1	0.7	0.7	5	4	4	3	2	2	20	10	9	6	6	4	
	Liver	3	3	2	2	1	1	10	8	7	5	5	4	28	18	18	12	11	8	
	Fat	2	2	1	1	0.7	0.7	5	4	4	3	2	2	20	10	9	6	6	4	
Aroclor 1254	Muscle	5	5	4	4	3	3	24	20	20	16	16	13	121	80	100	65	80	54	
	Liver	10	10	8	8	6	6	47	38	39	31	33	26	238	156	195	128	157	103	
	Fat	5	5	4	4	3	3	24	20	20	16	16	13	121	80	100	65	80	54	
Aroclor 1260	Muscle	8	8	8	8	7	7	54	44	50	40	47	38	355	233	333	217	308	202	
	Liver	16	16	14	14	14	14	106	84	98	80	91	74	698	457	654	426	605	397	
	Fat	8	8	8	8	7	7	54	44	50	40	47	38	355	233	333	217	308	202	

Regression Equation – $\log$ ppm PCB = $-1.3450 - 0.0190$ (day recovery) $- 0.3888$ ($\log$ ppm fed) $+ 0.2929$ (if liver) $+ 0.0376$ (% Cl_2) $+ 0.0202$ ($\log$ ppm fed $\times$ % Cl_2) $- 0.0917$ ($\log$ ppm fed – if female) $+ 0.0003$ (day recovery $\times$ % Cl_2)

TABLE XXIX

IBT #J7300 Toxicity Reproduction and Residue Study of Aroclor in White Leghorn Chickens

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ppm PCB in Chicken Tissues (Wet Weight Basis)

		Residue Sacrifice						30 Day Chick Sacrifice			1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	Final Sacrifice					
		1 ppm		10 ppm		100 ppm		1 ppm	10 ppm	100 ppm	1 ppm				10 ppm				100 ppm				1 ppm		10 ppm		100 ppm	
		♂	♀	♂	♀	♂	♀	♂ & ♀	♂ & ♀	♂ & ♀	30 Day Recovery Period												♂	♀	♂	♀	♂	♀
Aroclor 1242	Muscle	.	0.06				2	0.07	0.05															0.05		0.1		5
	Liver				2			0.4	0.2															0.7		2		45
	Fat	26	17			1430	1231																	4				8
	Eggs			5		38									3	0.6	0.5		26	30	19	24						
Aroclor 1254	Muscle	.		0.9	0.7			0.02																		0.1		
	Liver		0.8				50	0.09																0.9				27
	Fat			561	199																					73		
	Eggs	0.7				132						2	0.5	0.4						68	75	36						
Aroclor 1260	Muscle		0.2				11	0.06	0.8															0.04				2
	Liver				6			0.09	0.2																	13		
	Fat	153	15			6295	1159																	10				1010
	Eggs	1		13							1	0.7			13	8												

TABLE XXX

IBT #17300 Toxicity, Reproduction and Residue Study of Aroclor in White Leghorn Chickens

ppm PCB in Chicken Tissues (Lipid Weight Basis)

		Residue Sacrifice						30 Day Chick Sacrifice			1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	Final Sacrifice					
		1 ppm		10 ppm		100 ppm		1 ppm	10 ppm	100 ppm	1 ppm				10 ppm				100 ppm				1 ppm		10 ppm		100 ppm	
		♂	♀	♂	♀	♂	♀	♂♀♀	♂♀♀	♂♀♀	30 Day Recovery Period												♂	♀	♂	♀	♂	♀
Aroclor 1242	Muscle	-	13				901	9	12															8		30		637
	Liver				52			14	12															10		28		1583
	Fat	30	22			2460	1310																	4				9
	Eggs			37		472									33	5	5		383	361	249	368						
Aroclor 1254	Muscle	-		517	240			2																		61		
	Liver		18				1475	4																7				1539
	Fat			892	197																					78		
	Eggs	10				1410						14	6	5						1321	626	632						
Aroclor 1260	Muscle		40				6020	5	125															13				827
	Liver				86			6	6																	56		
	Fat	183	16			7580	1303																	11				1054
	Eggs	12		146							13	7			135	71												

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TABLE XXXI

IBT #J7300 · Toxicity, Reproduction and Residue Study of Aroclor in White Leghorn Chickens

Predicted ppm PCB in Chicken Tissues (Lipid Weight Basis)

		Residue Sacrifice						30 Day Chick Sacrifice			1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	Final Sacrifice					
		1 ppm		10 ppm		100 ppm		1 ppm	10 ppm	100 ppm	1 ppm				10 ppm				100 ppm				1 ppm		10 ppm		100 ppm	
		♂	♀	♂	♀	♂	♀	♂ & ♀	♂ & ♀	♂ & ♀	30 Day Recovery Period												♂	♀	♂	♀	♂	♀
Aroclor 1242	Muscle	20	12	196	119	1899	1152																10	6	92	56	893	541
	Liver	12	7	114	69	1104	669																12	7	104	63	1013	614
	Fat	20	12	196	119	1899	1152																10	6	92	56	893	541
	Eggs	3		40		498					2	0.9	0.6	0.4	25	16	10	7	424	362	308	263						
Aroclor 1254	Muscle	68	22	657	213	6358	2061																26	8	249	81	2409	782
	Liver	34	11	326	106	3163	1027																25	8	243	79	2338	759
	Fat	68	22	657	213	6358	2061																26	8	247	81	2409	782
	Eggs	7		92		1141					6	5	4	3	80	66	54	44	1007	881	775	681						
Aroclor 1260	Muscle	124	29	1196	284	11643	2762																42	10	377	90	3947	938
	Liver	57	24	552	131	5364	1275																42	10	366	87	3557	845
	Fat	124	29	1196	284	11643	2762																42	10	379	90	3947	938
	Eggs	11		140		1728					12	13	14	15	137	135	133	131	1543	1376	1231	1097						

Chicken Regression Equation $\log \text{ppm PCB} = -0.5311 + 0.9858 (\log \text{ppm fed}) + 0.7344 (\text{if female}) + 0.0438 (\%Cl_2) + 0.2908 (\text{if rec. liver}) - 0.0056 (\%Cl_2) \text{ if liver} - 0.0078 (\%Cl_2) \text{ if rec.} - 0.0226 (\%Cl_2) \text{ if female}$

Egg Regression Equation $\log \text{ppm PCB} = -0.7478 - 1.1794 (\text{rec. time}) + 1.0920 (\log \text{ppm fed}) + 0.0300 (\%Cl_2) + 0.5316 (\text{rec. time} \times \log \text{ppm fed}) + 0.0202 (\text{rec. time} \times \%Cl_2) - 0.0096 (\text{rec. time} \times \log \text{ppm fed} \times \%Cl_2)$

Chicken regression Equation — insufficient data

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TABLE XXXII

IBT #8746 Toxicity, Reproduction and Residue Study of Aroclor in White Leghorn Chickens

ppm PCB in Chicken Tissues (Wet Weight Basis)

		Residue Sacrifice			30 Day Chick Sacrifice			1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	Final Sacrifice		
		2 ppm	4 ppm	8 ppm	2 ppm	4 ppm	8 ppm	2 ppm				4 ppm				8 ppm				2 ppm	4 ppm	8 ppm
		♂♀	♂♀	♂♀	♂♀	♂♀	♂♀	30 Day Recovery Period												♂♀	♂♀	♂♀
Aroclor 1242	Muscle			1	0.02	0.04	0.03													0.5		1
	Liver		4		0.3	0.2	0.2														21	
	Fat			56	2	3	5													11		43
	Eggs	1							1		1	2		1			4					

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TABLE XXXIII

IBT #8746 Toxicity, Reproduction and Residue Study of Aroclor in White Leghorn Chickens

ppm PCB in Chicken Tissues (Lipid Weight Basis)

		Residue Sacrifice			30 Day Chick Sacrifice			1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	Final Sacrifice		
		2 ppm	4 ppm	8 ppm	2 ppm	4 ppm	8 ppm	2 ppm				4 ppm				8 ppm				2 ppm	4 ppm	8 ppm
		♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀													♂ ♀	♂ ♀	♂ ♀
Aroclor 1242	Muscle			84	5	8	13													19		71
	Liver		30		15	19	17														17	
	Fat			73	3	5	9													14		56
	Eggs	14							14		15	22		25			42		28			

TABLE XXXIV

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IBT #8746. Toxicity, Reproduction and Residue Study of Aroclor in White Leghorn Chickens

Predicted ppm PCB in Chicken Tissues (Lipid Weight Basis)

		Residue Sacrifice			30 Day Chick Sacrifice			1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	1st wk	2nd wk	3rd wk	4th wk	Final Sacrifice		
		2ppm	4 ppm	8 ppm	2ppm	4 ppm	8 ppm	2 ppm				4 ppm				8 ppm				2ppm	4 ppm	8 ppm
		♂♀	♂♀	♂♀	♂♀	♂♀	♂♀													♂♀	♂♀	♂♀
Aroclor 1242	Muscle	31	62	123	7	9	11													15	29	58
	Liver	18	36	71	15	15	15													17	33	66
	Fat	31	62	123	6	6	6													15	29	58
	Eggs	7	15	32				4	2	1	0.5	8	5	3	1	19	12	7	4			

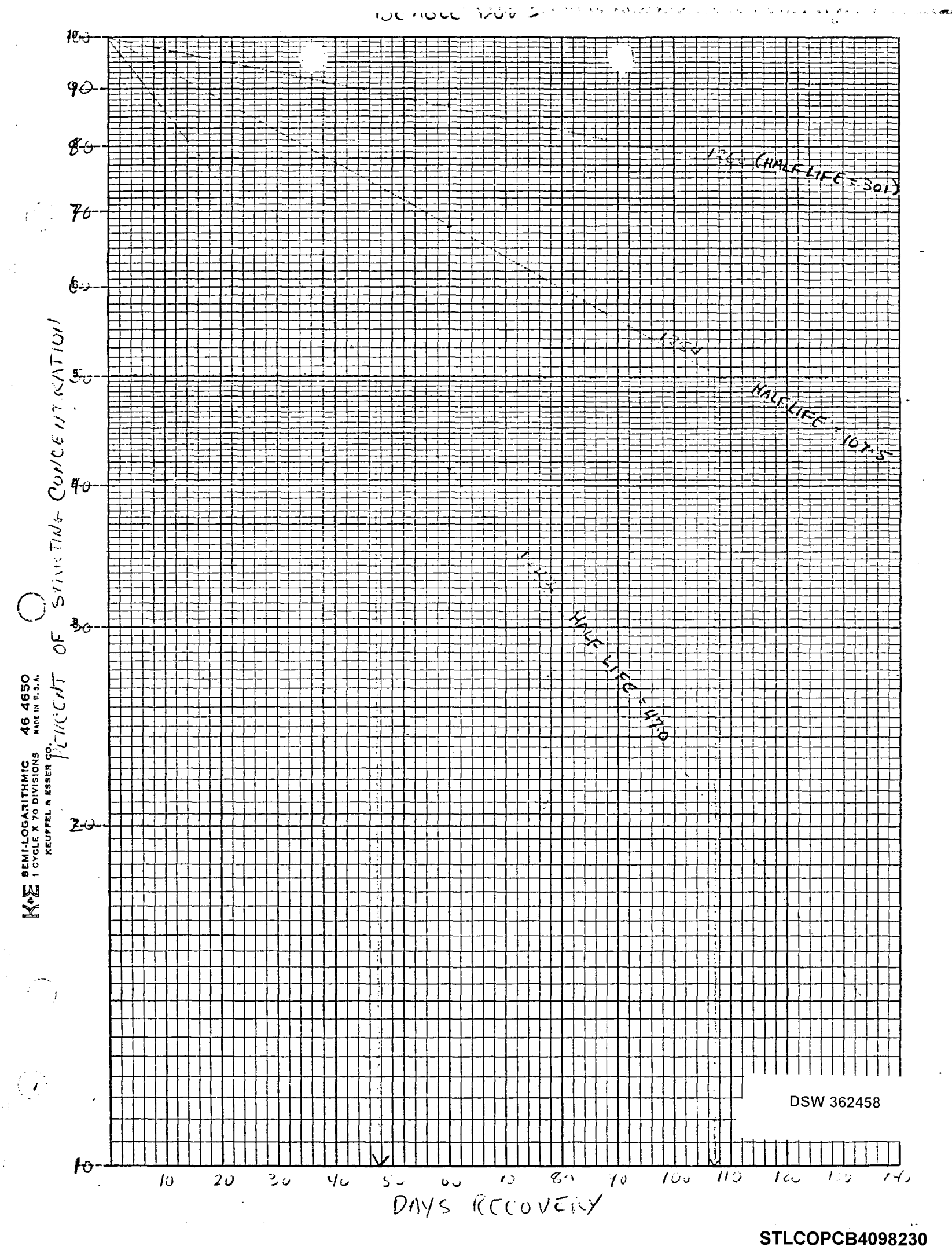
Chick Regression Equation – log ppm PCB = 0.7436 + 0.4385 (if liver) + 0.3317 (log ppm fed – if muscle)

BEAGLE DOGS. RECOVERY SLOPE

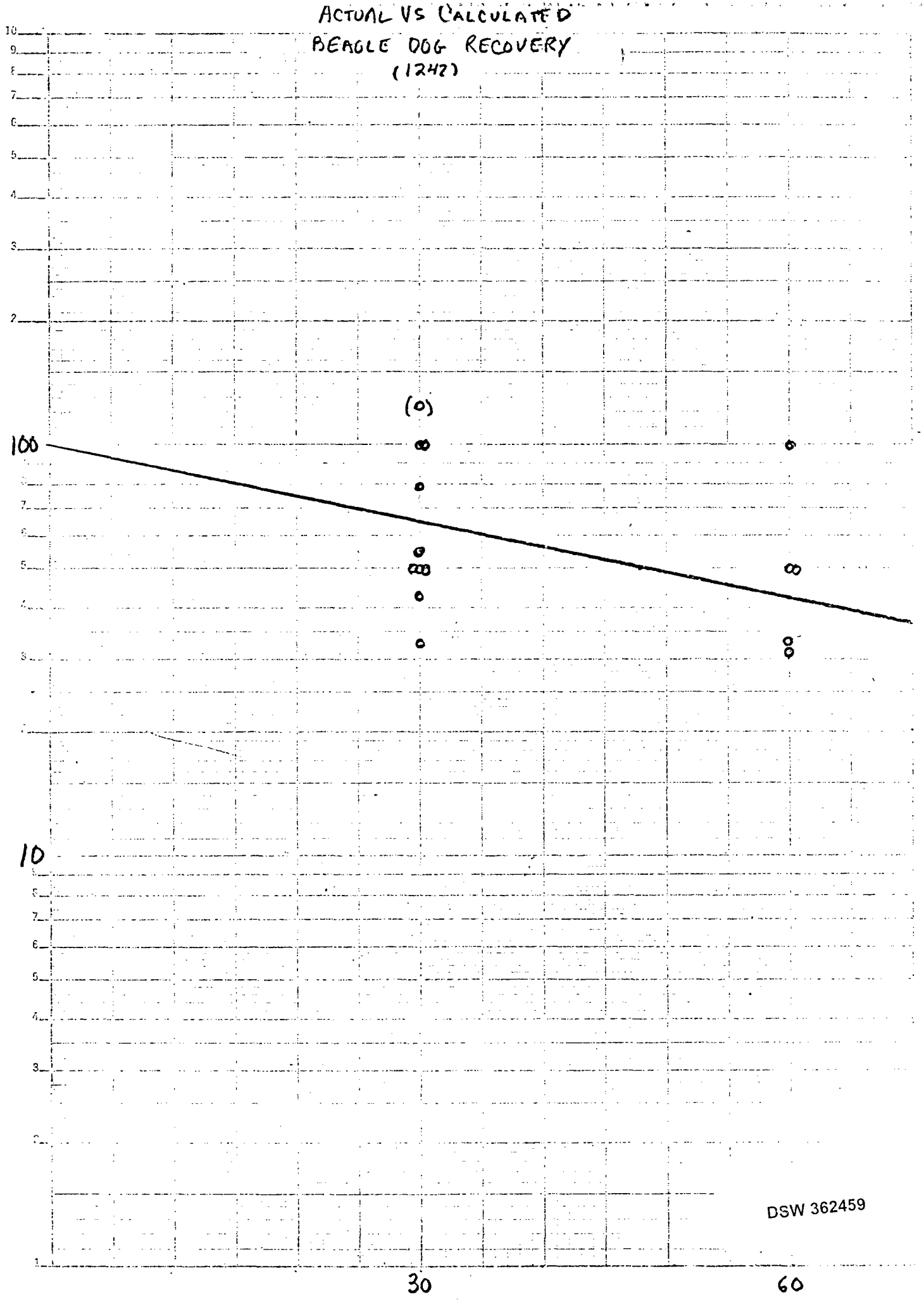
		30 DAY	60 DAY	HALF LIFE
1242	-0.0064	64.2	41.3	47.0
1254	-0.0028	82.4	67.9	107.5
1260	-0.0010	94.8	87.1	301.0

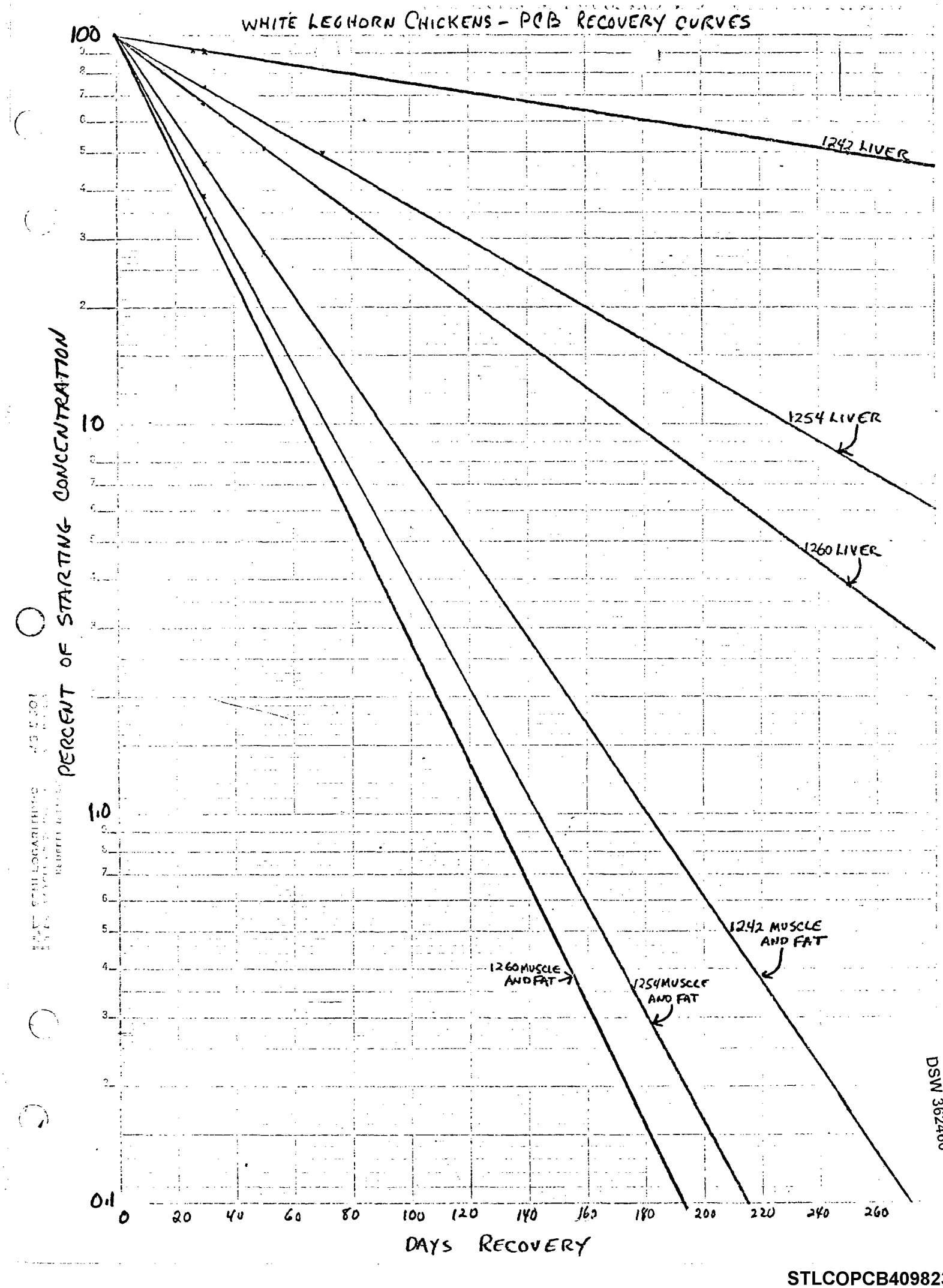
CHICKENS -	RECOVERY SLOPE (30 DAYS)	30 DAY	
1242 FAT+MUSCLE	-0.3276	47.0	27.6
1242 LIVER	-0.0368	91.9	245.4
1254 FAT+MUSCLE	-0.4212	37.9	21.4
1254 LIVER	-0.1304	74.1	69.3
1260 FAT+MUSCLE	-0.4680	34.1	19.3
1260 LIVER	-0.1772	66.5	51.0

DSW 362457



STLCOPCB4098230


ACTUAL VS CALCULATED
BEAGLE DOG RECOVERY
(1242)
(0)
100
10
30
60
DSW 362459



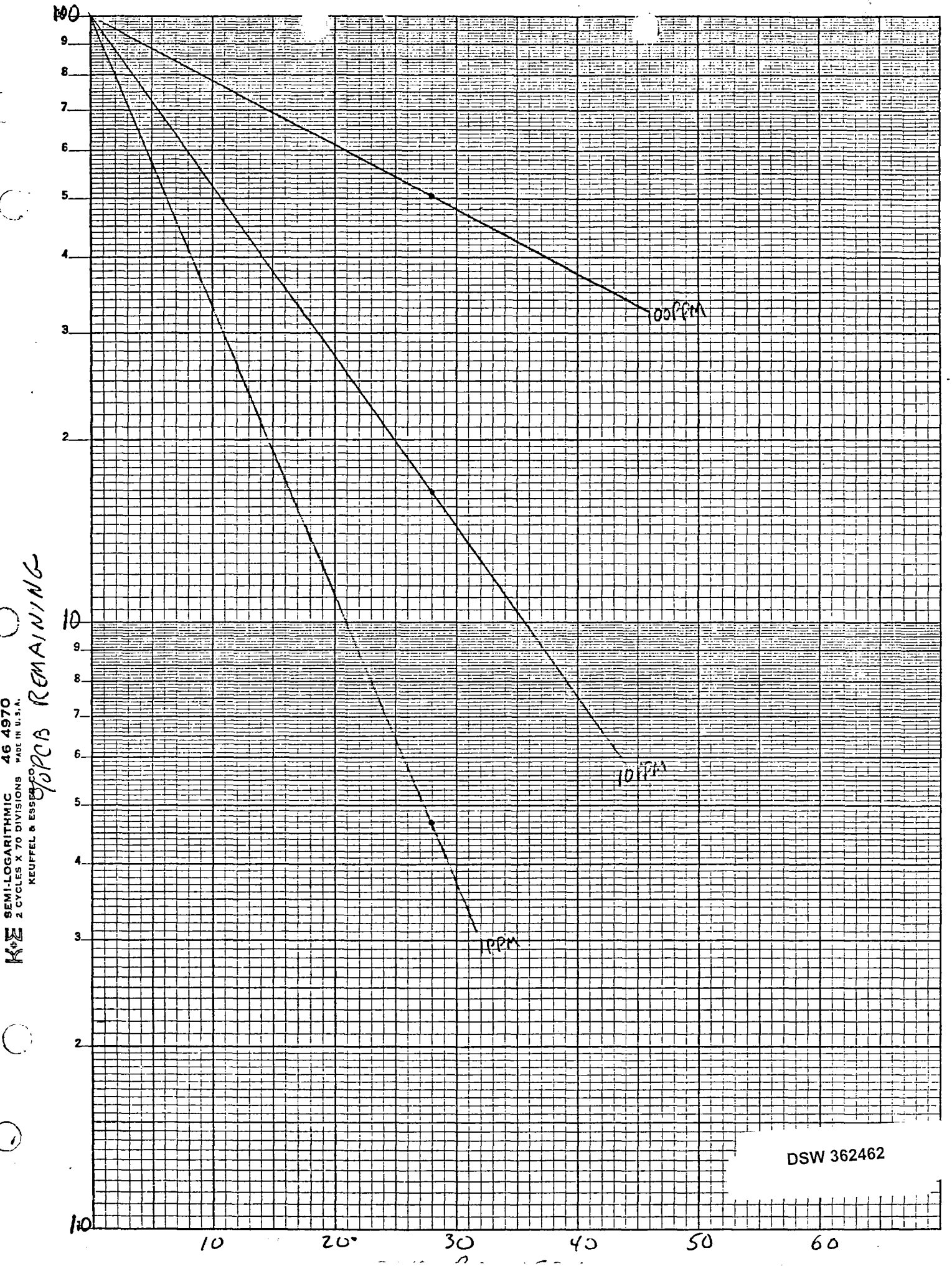
STLCOPCB4098232

HALF-LIFE DATA, PCB IN EGGS
PREDICTED VALUES

PCB	EGG LEVEL	% LEFT (4 WKS)	HALF LIFE
1242	1.0 PPM	4.7%	6 days
	10.0 PPM	16.5%	11 days
	100.0 PPM	50.5%	28 days
1254	1.0 PPM	44.3%	24 days
	10.0 PPM	50.0%	28 days
	100.0 PPM	56.4%	34 days
1260	1.0 PPM	135.0%	—
	10.0 PPM	89.8%	144 days.
	100.0 PPM	59.6%	37 days.

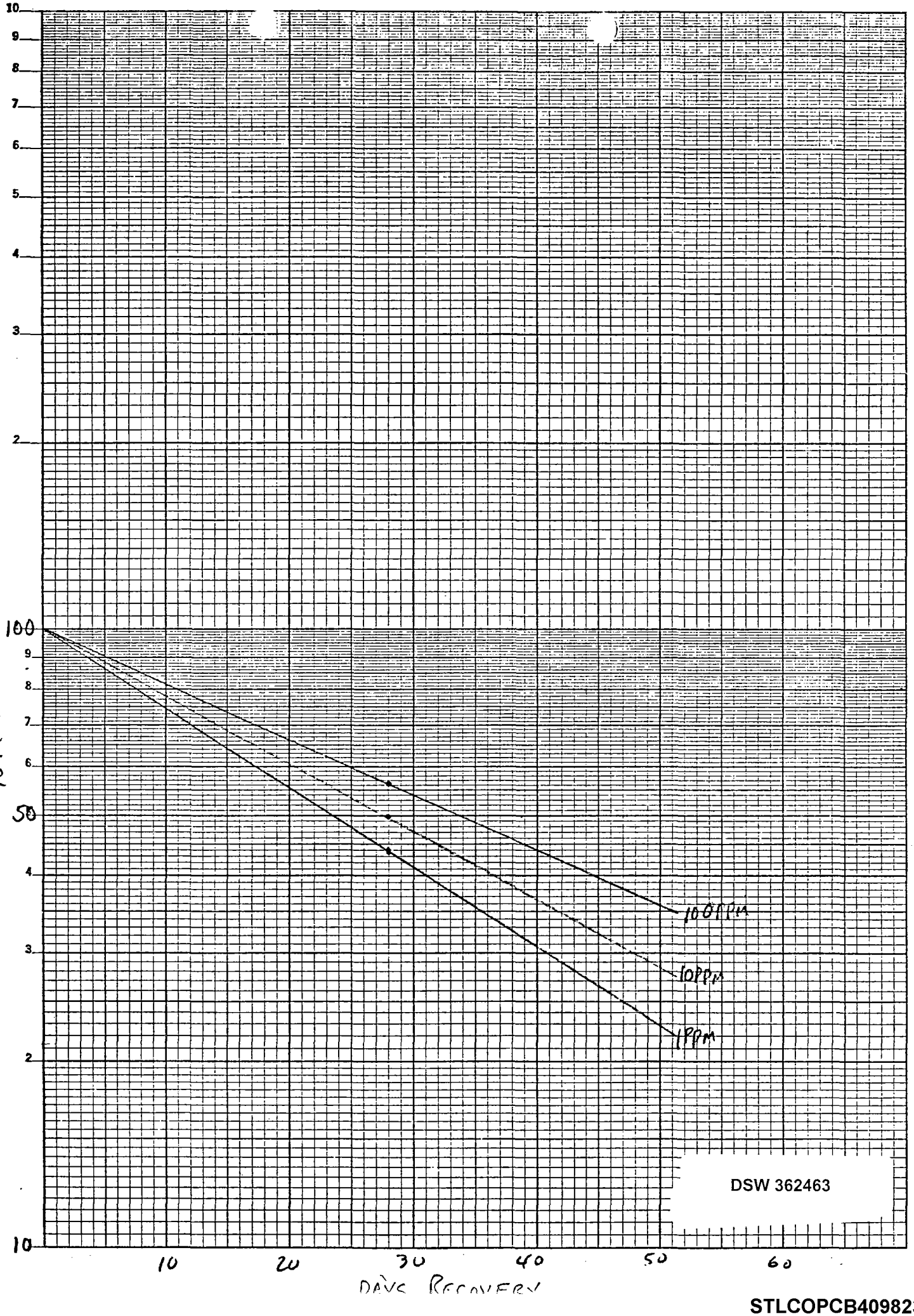
DSW 362461

EGGS - 1242



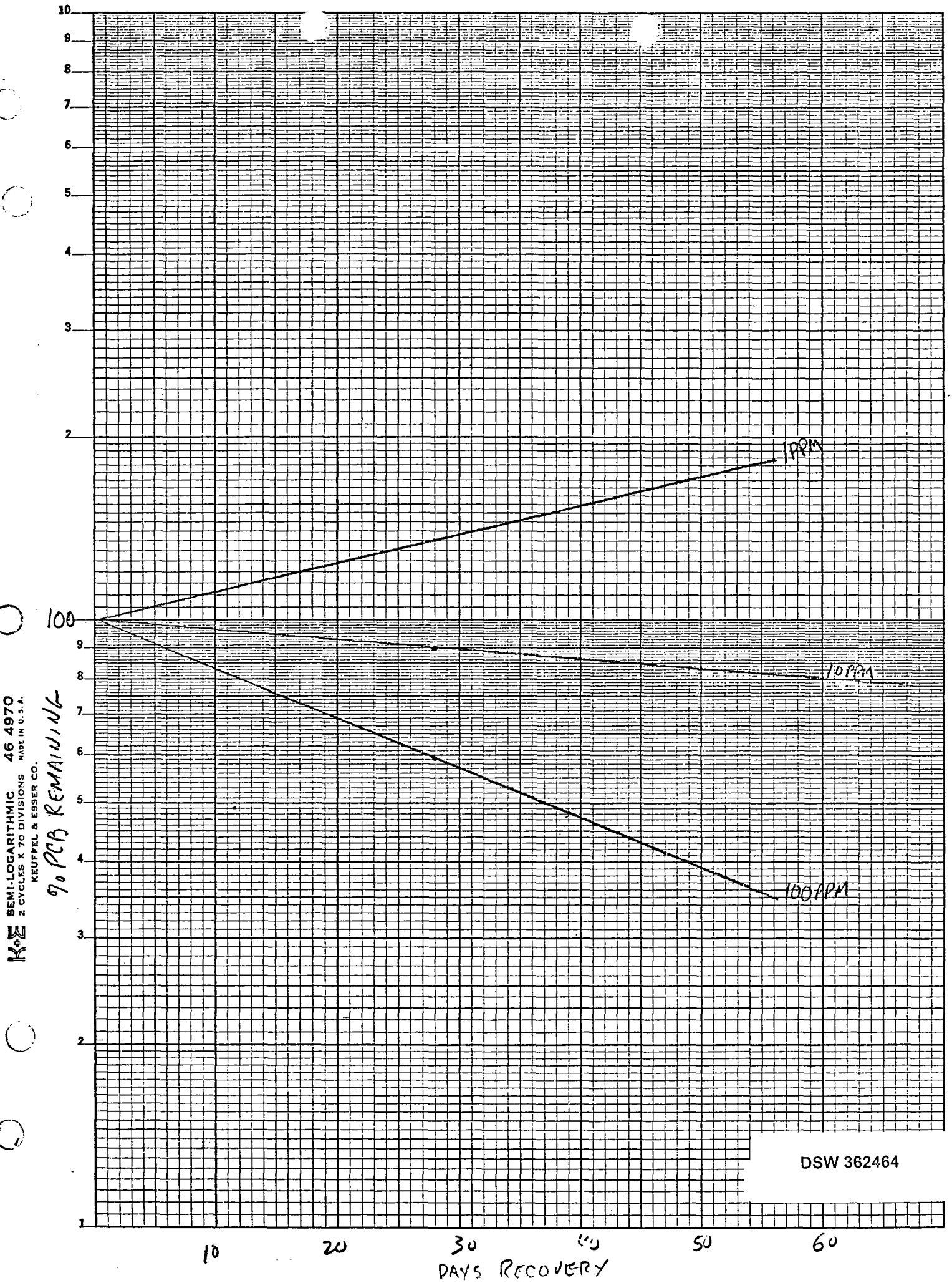
STLCOPCB4098234

EGLS 1254



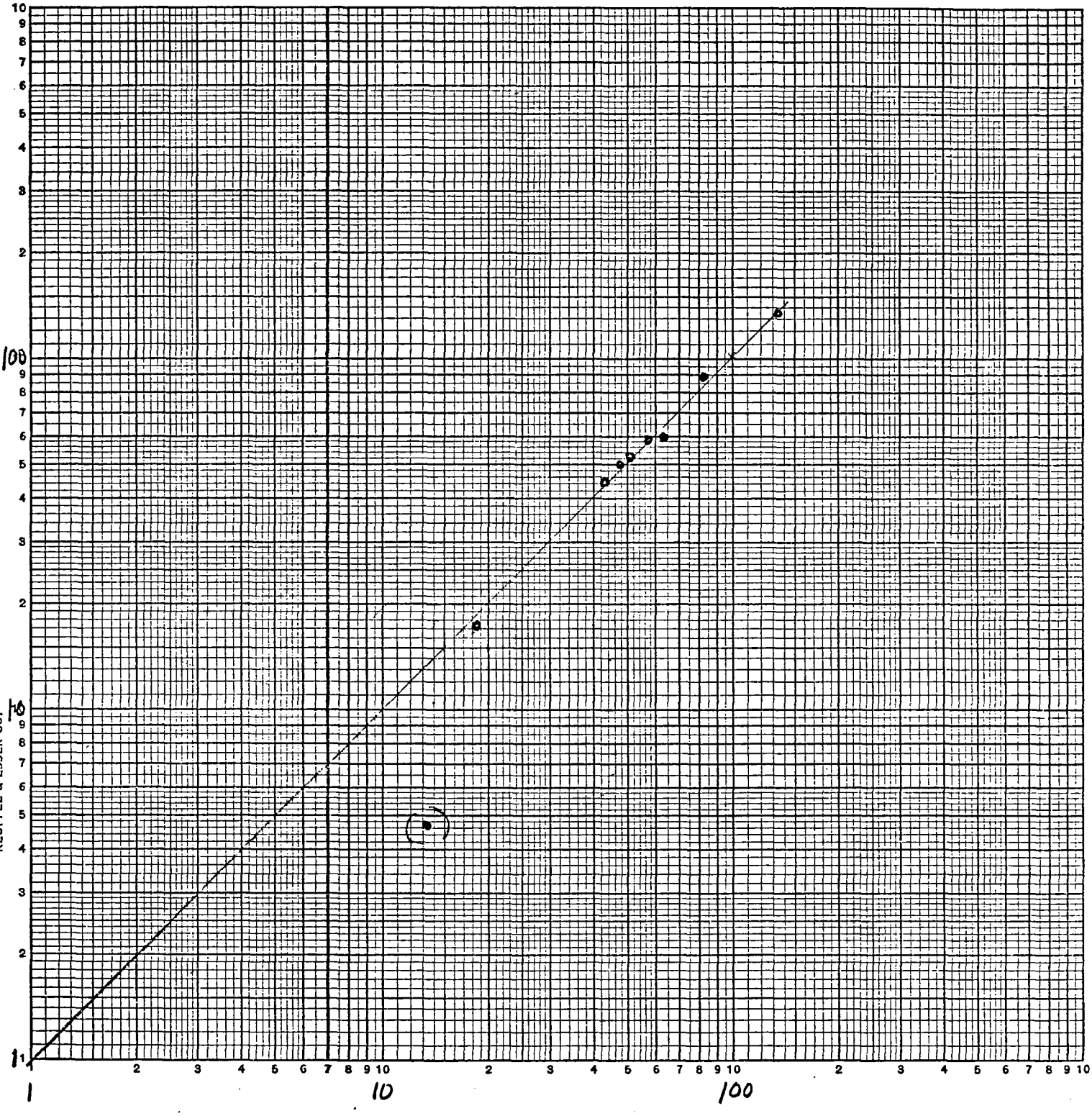
STLCOPCB4098235

EGGS 1260



STLCOPCB4098236

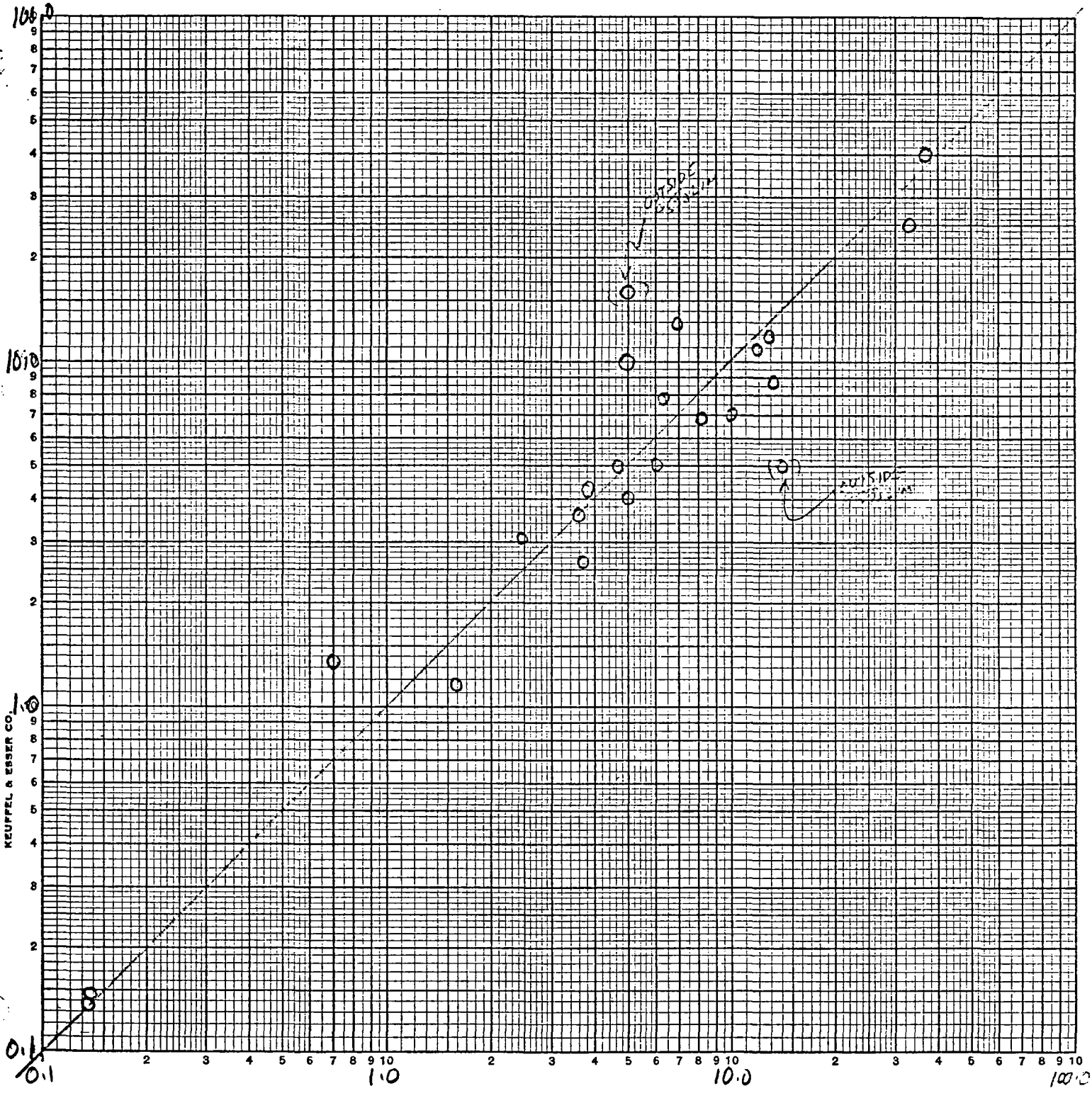
EGG DATA



PREDICTED % LEFT
ORIGINAL EQUATION

DSW 362465

PREDICTED VS ACTUAL
ORIGINAL EQUATION
EGGS



DSW 362466