PROJECT KELVIN DRILL HOLE NO. J-5 SCALE 1"=100' PAGE NO. 3 OF 4

LENGTH	ASSAYS (%) Cu	Mo	S	calc. wt % sulfide	py/cp
1700–1800	0.97	.0512	.0024	.1665	.363	1.5
1800–1900	5.27	.0980	.0024	.3465	.746	1.6
1900–2200	3.24	.3309	.0047	.7892	1.808	0.89

Mineralization & Miscellaneous

.0079 Zinc

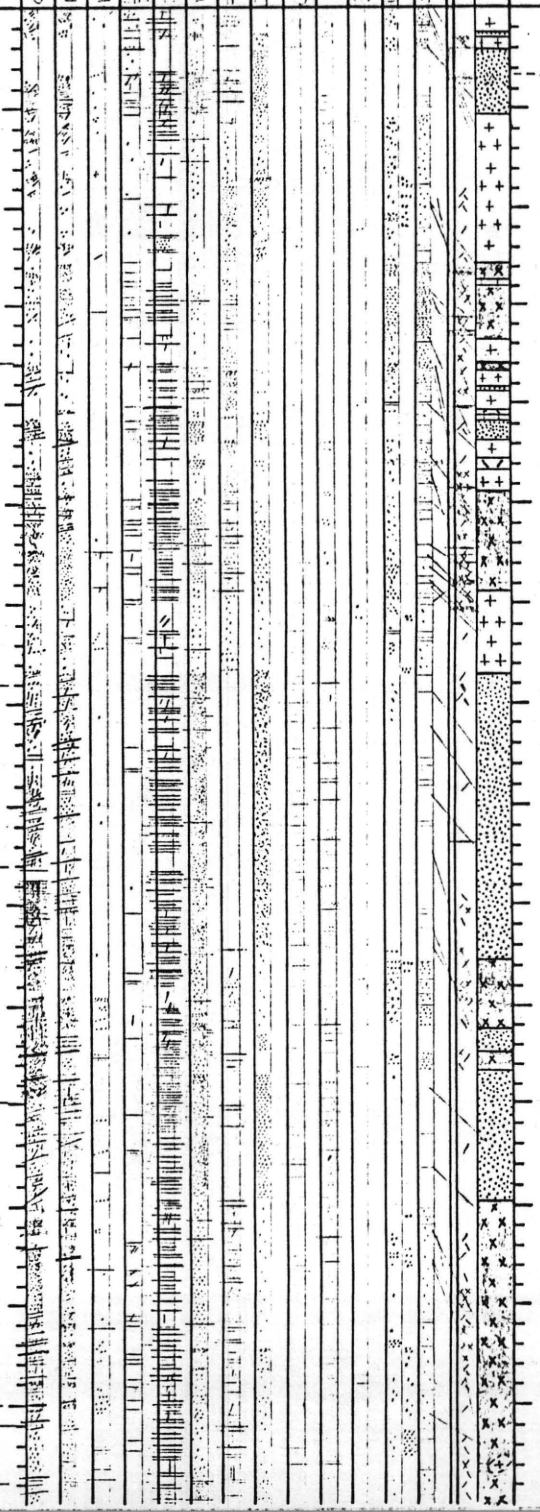
1680-2200 = 520 feet = 2.961 % magnetite compared to 0.432 above & 0.514 below

1840-2240 = 400 feet =
.2619 % Copper
.0042 % Molybdenum
.2829 % Copper Equivalent
1.483 total sulfides (wt.)
0.876 (vol.). py:cp = 0.96:1

1930-2050 = 120 feet =
.4192 % Copper
.0036 % Molybdenum
.4372 % Copper equivalent
(based on 3 replicate assays)

1930-2210 = 280 feet =
.3121 % Copper
.0039 % Molybdenum
.3316 % Copper equivalent

1.4 ppm Silver compared to less than 0.2 ppm above and below.



Summary Lithology

1490-1493
1514-1516
1520½-1554
} Precambrian Diabase: very fine-grained diabasic texture (aphanitic) with tor

SERICITIC ALTERATION ASSEMBLAGE (?): plagioclase altered 80% to sericite + trace K-spar, quartz & chlorite. Mafics altered 70% to chlorite & 25% to magnetite, K-spar altered 5% to chlorite + trace sericite & quartz

1493-1514
1516-1520½
1554-1629
1637½-1640
1669-1680
1685-1692
1694-1704
1706-1709
1719-1728
1733-1745
1794-1836
} Precambrian Oracle Granite

This assemblage may be highly affected by the strong structure present; may be a weaker phase of Potassic assemblage below - 2nd biotite & epidote gen. absent.

1704-1706
1728-1733
} Paleocene Teacut Granodiorite: see description below.

1692-1694
1709-1719
1836-1977
2012-2024
2033-2099½
} Precambrian Diabase: very fine-grained highly magnetic, diabasic texture only locally apparent.

POTASSIC ALTERATION ASSEMBLAGE: In general: plagioclase in intermediate rocks altered 50% to sericite, 10% to K-spar, 5% to biotite, plagioclase in diabase altered 20% to sericite, 15% to biotite and 10% to actinolite. Mafic minerals in intermediate rocks altered 70% to chlorite, 25% to biotite & 5% to magnetite; mafic minerals in diabase altered 30% to biotite, 15% to actinolite and 5% to chlorite. Secondary biotite (probably associated with magnetite) is common in the matrix of all rocks. It appears that a biotite-magnetite-quartz assemblage is common in the diabase while a chlorite-secondary K-spar assemblage is common in the intermediate rocks. Some chlorite may be due to a later stage overprint. Primary K-spar throughout the interval generally fresh to minor recrystallization to secondary K-spar to "dusted" with sericite, quartz, chlorite or biotite. Epidote & zeolite common at center of zone (late?)

1629-1637½
1640-1669
1680-1685
1745-1794
1977-2012
2024-2033
2099½-2257
} Tertiary-Cretaceous Granodiorite Porphyry: a medium-gray rock with plagioclase phenocrysts up to 0.25" in a medium-grained groundmass of plagioclase, quartz, biotite, magnetite and interstitial K-spar. Chilled margins (up to 30") are common in dikes less than [illegible] wide. Chilled & the typical equigranular to slightly porphyritic texture is absent.

PROJECT KELVIN DRILL HOLE NO. L/-5 SCALE 1" = 100' PAGE NO. 4 OF 4

LENGTH	ASSAYS (%) Cu	Mo	S	calc wt % sulfide	py/cp	Mineralization & Miscellaneous
	0.58	.0738	.0055	.1960	.441	1.1	Zone of high Cobalt = 43 ppm compared to 17 ppm above & 18ppm below. 1840-2200 = 60ppm.
2500						
2400	1.16	.0870	.0032	.3641	.768	2.1	.0168 Zinc
2500						
2600	0.20	.0310	.0022	.0730	.168	0.87	.0045 Zinc
2700						
2800							completed 27 April 1977

2825' is total length.

1400-2825:
LOGGED BY: J. P. VROMAN

Summary Lithology & Alteration

2257-2315
2318-2321½
2322½-2324
2332-2333½
2334½-2341
} Precambrian Oracle Granite:

2315-2318
2321½-2322½
2324-2332
2333½-2334½
2352-2355
2357-2359
2362-2367
2413-2424
} Tertiary-Cretaceous Granodiorite Porphyry

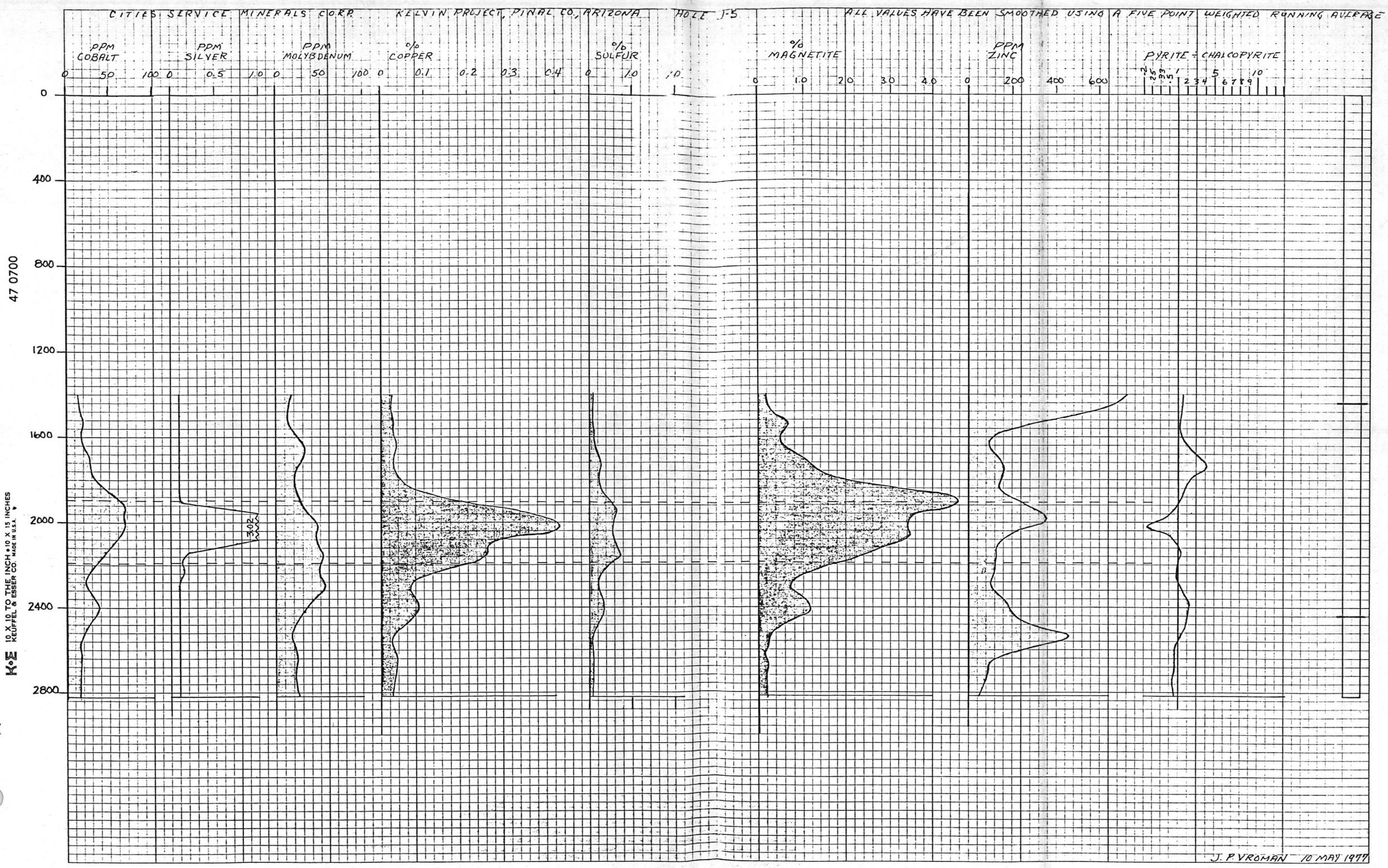
2341-2352
2355-2357
2359-2362
2367-2413
2424-2435
} Tertiary-Cretaceous Metamorphic Rhyodacite Porphyry: approximately 20 percent phenocrysts (in order of decreasing abundance) subhedral plagioclase up to 10mm; rounded quartz to 3mm and mafics (hornblende and/or biotite) up to 3mm, in a matrix of the same minerals + K-spar. magnetite averages 0.8 vol. percent.

2435-2440 - Precambrian Diabase

2440-2475½ - intimate mixture of Precambrian Oracle Granite, Precambrian Diabase, Paleocene Teacup Granodiorite, & Tertiary-Cretaceous Granodiorite Porphyry III - Possible fault zone with important movement.

PROPYLITIC ALTERATION ASSEMBLAGE: Overall; plagioclase is altered 15% to sericite & 10% to clay minerals - a trace of secondary K-spar & carbonate is sometimes present in phenocrysts. Original K-feldspar is fresh with very rare recrystallization to secondary K-spar or replaced by quartz. Over 50 % of the mafic minerals are altered to chlorite - the remainder are fresh. Epidote is common in veins, veinlets & interstitial as is secondary K-spar. No secondary pyrite seen. Magnetite content is low.

2475½-2825: Paleocene Teacup Granodiorite: porphyritic with phenocrysts of euhedral to subhedral light-colored plagioclase up to 0.4 inch in length, prominent light-gray anhedral quartz averaging 0.3 inch (up to 0.6 inch) in a medium-grained groundmass of the same minerals, euhedral biotite up to 0.1 inch, hornblende up to 0.05 inch and probable interstitial K-spar. Fresh specimens are light gray to nearly white in overall color.


CITIES SERVICE MINERALS CORP. KELVIN PROJECT, PINAL CO., ARIZONA HOLE J-5
ALL VALUES HAVE BEEN SMOOTHED USING A FIVE POINT WEIGHTED RUNNING AVERAGE
PPM COBALT
0 50 100
PPM SILVER
0 0.5 1.0
PPM MOLYBDENUM
0 50 100
% COPPER
0 0.1 0.2 0.3 0.4
% SULFUR
0 1.0 2.0
% MAGNETITE
0 1.0 2.0 3.0 4.0
PPM ZINC
0 200 400 600
PYRITE = CHALCOPYRITE
.2 .25 .33 .5 1 2 3 4 5 6 7 8 9 10
0
400
800
1200
1600
2000
2400
2800
3.02
47 0700
K+E 10 X 10 TO THE INCH • 10 X 15 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
J. P. VROMAN 10 MAY 1977

AMPAD EFFICIENCY® LINE NO. 6636

HOLE J-5 REPLICATE SAMPLES

INTERVAL		1 SAMPLE	% COPPER: 2 American Analytical	3 Skyline	4 Rocky Mtn.	5	6	7	PPM MOLYBDENUM: 8 American Analytical	9 Skyline	10 Rocky Mtn	11	12	13
1930-1940	1	J5-194	.51	.49	.58	.		.50	42	10	13			
1940-1950	2	-195	.61	.16	.57	.		.59	31	30	21			
	3	196	.53	.57	.47	.		.52	26	16	17			
	4	197	.21	.54	.14	.		.18	37	18	19			
	5	198	.34	.32	.33			.33	25	12	19			
	6	199	.24	.19	.20			.21	47	46	50			
1990-2000	7	200	.20	.20	.22			.21	60	34	34			
	8	201	.61	.37	.41	.		.39	79	16	39			
	9	202	.23	.25	.25			.24	36	14	14			
	10	203	.36	.44	.33	.	M	.38	107	120	93			
	11	204	1.44	.98	.84	.	M	1.09	21	20	18			
2040-2050	12	205	.41	.38	.38			.39	40	32	29			
	13	206	.19	.26	.23			.23	87	50	48			
	14	207	.16	.14	.11			.14	26	30	8			
	15	208	.11	.15	.20	.		.15	11	2	3			
	16	209	.04	.03	.04			.04	17	2	3			
2090-2100	17	210	.14	.19	.13	.		.15	42	42	23			
	18	211	.20	.18	.18			.19	25	12	12			
	19	212	.11	.08	.10			.10	27	8	9			
	20	213	.27	.41	.41	.		.41	54	38	34			
	21	214	.46	.29	.27	.		.28	171	145	113			
2140-2150	22	215	.41	.46	.47	.		.46	38	28	32			
	23	216	.20	.20	.23			.21	31	22	33			
	24	217	.33	.35	.32			.33	67	48	80			
	25	218	.33	.41	.30	.		.32	47	42	39			
	26	219	.23	.21	.18			.21	34	14	18			
2190-2200	27	220	.19	.22	.29	.		.20	62	56	105			
2200-2210	28	221	.21	.24	.31	.	M	.29	45	40	49			
	29		6.1%	0.3%	2.9%			.						
MEAN 1930-2210	30	28% .329	.3311	.3111	.3032	8%		.3121	48	34	35			
MEAN 1930-2050	31	12% .434	.4742	.4075	.3933	17%		.4192	46	31	30			
			13.1%	2.8%	6.2%									

AMPAD EFFICIENCY® LINE NO. 6636

1840 - 2240 = .2619 + 424 ppm Mo

.235 Cu equiv

CSMC KELVIN PROJECT : HOLE J-5

INTERVAL	1 % Cu	2 wt. % cp. (Cu × 2.8885)	3 % S in Cp (Cu × 1.00925)	4 % S	5 % S in py (#4 minus #3)	6 wt. % py (#5 × 1.8709)	7 TOTAL SULFIDES (py + cp)	8 py/cp	9 % Mo	10 % Fe_3O_4	11 % Zn	12 PPM Ag	13 PPM Co
	ASSAY			ASSAY					ASSAY		ASSAY	ASSAY	ASSAY
1400-1440 1	.0268	.0774	.0270	.0895	.0625	.1169	.194	1.5	.0022	.266	.0366	< 0.2	14
1440-1480 2	.0205	.0592	.0207	.0680	.0473	.0885	.148	1.5	.0008	.096	.0366	< 0.2	14
1480-1520 3	.0204	.0589	.0206	.0590	.0384	.0718	.131	1.2	.0014	.178	.0242	< 0.2	14
1520-1560 4	.0318	.0919	.0321	.1065	.0744	.1392	.231	1.5	.0011	1.295	.0121	< 0.2	32
1560-1600 5	.0237	.0685	.0239	.0230	—	—	.068	—	.0014	.414	.0024	< 0.2	12
1600-1640 6	.0419	.1210	.0423	.1640	.1217	.2277	.349	1.9	.0036	.296	.0040	< 0.2	14
1640-1680 7	.0470	.1358	.0474	.1705	.1231	.2303	.366	1.7	.0036	.482	.0047	< 0.2	20
1680-1720 8	.0510	.1473	.0515	.2010	.1495	.2797	.427	1.9	.0034	1.423	.0057	< 0.2	34
1720-1760 9	.0678	.1958	.0684	.3680	.2996	.5605	.756	2.9	.0017	1.040	.0111	< 0.2	28
1760-1800 10	.0971	.2805	.0980	.1155	.0175	.0327	.313	.12	.0024	1.509	.0086	< 0.2	30
1800-1840 11	.0490	.1415	.0495	.1835	.1340	.2507	.392	1.8	.0018	1.303	.0040	< 0.2	28
1840-1880 12	.1066	.3079	.1076	.3280	.2204	.4123	.720	1.3	.0027	5.184	.0089	< 0.2	58
1880-1920 13	.0894	.2582	.0902	.3650	.2748	.5141	.772	2.0	.0021	5.354	.0096	< 0.2	70
1920-1960 14	.4475	1.2926	.4516	.9560	.5044	.9437	2.236	.73	.0031	4.512	.0118	< 0.2	74
1960-2000 15	.2475	.7149	.2498	.5040	.2542	.4756	1.190	.67	.0042	2.412	.0292	0.3	56
2000-2040 16	.6775	1.9570	.6838	1.3800*	.6962	1.3025	3.260	.67	.0061	3.280	.0097	7.5	77
2040-2080 17	.2175	.6282	.2195	.6545	.4350	.8138	1.442	1.3	.0041	4.403	.0077	0.2	68
2080-2120 18	.1230	.3553	.1241	.3650	.2409	.4507	.806	1.3	.0028	3.023	.0064	< 0.2	50
2120-2160 19	.3341	.9650	.3372	1.1450	.8113	1.5179	2.483	1.6	.0074	1.890	.0062	0.3	42
2160-2200 20	.2693	.7779	.2718	.5200	.2482	.4644	1.242	.60	.0052	3.164	.0054	0.2	43
2200-2240 21	.1065	.3076	.1075	.3100	.2025	.3789	.686	1.2	.0042	.738	.0072	< 0.2	26
2240-2280 22	.0723	.2088	.0730	.1560	.0830	.1553	.364	.74	.0037	.708	.0055	< 0.2	24
2280-2320 23	.0425	.1228	.0429	.1220	.0791	.1480	.271	1.2	.0087	.288	.0030	< 0.2	14
2320-2360 24	.0927	.2678	.0936	.3400	.2464	.4610	.729	1.7	.0031	1.496	.0063	< 0.2	34
2360-2400 25	.0771	.2227	.0778	.3260	.2482	.4644	.687	2.1	.0033	.682	.0105	< 0.2	38
2400-2440 26	.1098	.3172	.1108	.5960	.4852	.9078	1.225	2.9	.0044	1.793	.0096	< 0.2	42
2440-2480 27	.0685	.1979	.0691	.1945	.1254	.2346	.433	1.2	.0019	.680	.0103	< 0.2	30
2480-2520 28	.0329	.0950	.0332	.1320	.0988	.1848	.280	1.9	.0018	.188	.0060	< 0.2	20
2520-2560 29	.0182	.0525	.0184	.0465	.0281	.0526	.105	1.0	.0014	.163	.0476	< 0.2	18
2560-2600 30	.0163	.0471	.0165	.0440	.0275	.0514	.099	1.1	.0022	.256	.0075	< 0.2	16
2600-2640 31	.0540	.1560	.0545	.1055	.0510	.0954	.251	.61	.0026	.202	.0070	< 0.2	18

AMPAD EFFICIENCY® LINE NO. 6636

	ASSAY			ASSAY					ASSAY		ASSAY	ASSAY	ASSAY
	1 % Cu	2 wt. % cp	3 % S in cp	4 % S	5 % S in py	6 wt % py	7 TOTAL SULFIDES	8 py/cp	9 % Mo	10 % Fe_3O_4	11 % Zn	12 PPM Ag	13 PPM C
2640-2680 1	.0387	.1118	.0391	.0835	.0444	.0831	.195	.74	.0022	.252	.0036	<0.2	18
2680-2720 2	.0339	.0979	.0342	.0770	.0428	.0801	.178	.82	.0022	.179	.0039	<0.2	18
2720-2760 3	.0339	.0979	.0342	.0580	.0238	.0445	.142	.45	.0020	.158	.0047	<0.2	16
2760-2800 4	.0265	.0765	.0267	.0535	.0268	.0501	.127	.65	.0024	.245	.0026	<0.2	16
2800-2825 5	.0248	.0716	.0250	.0570	.0320	.0599	.132	.84	.0027	.200	.0021	<0.2	18
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AMPAD EFFICIENCY LINE NO. 6636

CSMC KELVIN PROJECT: HOLE J-5

5pt weighted running average

Interval

value = $\frac{1x - 3x - 5x - 3x - 1x}{13}$

INTERVAL	1 % Cu	2 % Mo	3 % Zn	4 % S	5 PPM Ag	6 wt. % py	7 py/cp.	8	PPM Co	10 vol % cp. (Cu x 1.8363)	11 vol % pyrite (wt py x 0.532)	12 vol. % Fe_3O_4	13 Mc.
1400-1440 1	.0239	.0016	.0352	.0789	<0.2	.1025	1.5		14.	.0439	.0545	.200	4.5
1440-1480 2	.0230	.0013	.0315	.0743	<0.2	.0956	1.4		16.	.0422	.0509	.259	5.3
1480-1520 3	.0238	.0013	.0235	.0716	<0.2	.0890	1.3		18.	.0437	.0473	.442	8.0
1520-1560 4	.0272	.0014	.0139	.0777	<0.2	.0940	1.2		20.	.0499	.0500	.665	11.5
1560-1600 5	.0305	.0020	.0069	.0889	<0.2	.1087	1.2		18.	.0560	.0578	.577	10.4
1600-1640 6	.0355	.0029	.0045	.1314	<0.2	.1788	1.7		18.	.0652	.0951	.530	10.4
1640-1680 7	.0362	.0032	.0051	.1799	<0.2	.2682	2.6		22.	.0665	.1427	.694	13.5
1680-1720 8	.0344	.0030	.0068	.2231	<0.2	.3524	3.5		28.	.0632	.1875	1.037	19.3
1720-1760 9	.0320	.0024	.0082	.2418	<0.2	.3920	4.2		29.	.0588	.2085	1.214	22.2
1760-1800 10	.0395	.0022	.0079	.2124	<0.2	.3228	2.8		32.	.0725	.1717	1.629	28.1
1800-1840 11	.0568	.0022	.0072	.2293	<0.2	.3217	2.0		39.	.1043	.1711	2.538	42.2
1840-1880 12	.1079	.0024	.0081	.3352	<0.2	.4234	1.4		53.	.1981	.2252	3.993	66.2
1880-1920 13	.1843	.0026	.0110	.4896	.12	.5680	1.1		64.	.3384	.3022	4.583	78.4
1920-1960 14	.3102	.0033	.0149	.6302	.72	.5933	.66		68.	.5696	.3156	4.179	76.0
1960-2000 15	.3784	.0042	.0175	.6031	1.89	.4138	.38		67.	.6949	.2201	3.476	65.9
2000-2040 16	.4118	.0047	.0136	.5526	3.02	.2563	.22	✓	68.	.7561	.1364	3.414	64.6
2040-2080 17	.3131	.0045	.0094	.5730	1.81	.4808	.53		63.	.5749	.2558	3.479	64.6
2080-2120 18	.2474	.0046	.0068	.6324	.75	.7160	1.0		54.	.4543	.3809	3.111	59.2
2120-2160 19	.2440	.0053	.0063	.7188	.21	.8841	1.3		45.	.4481	.4703	2.550	52.0
2160-2200 20	.2202	.0052	.0061	.5758	.13	.6615	1.0		38.	.4044	.3519	2.110	43.0
2200-2240 21	.1488	.0049	.0060	.3727	.14	.4163	.97		30.	.2732	.2215	1.345	27.6
2240-2280 22	.0900	.0050	.0054	.2258	.11	.2525	.97		24.	.1653	.1343	.868	17.5
2280-2320 23	.0685	.0055	.0052	.2103	<0.2	.2641	1.3		24.	.1258	.1405	.729	14.9
2320-2360 24	.0773	.0046	.0067	.2843	<0.2	.3859	1.7		30.	.1419	.2053	.992	20.1
2360-2400 25	.0849	.0038	.0087	.3657	<0.2	.5239	2.1		36.	.1559	.2787	1.096	23.0
2400-2440 26	.0855	.0033	.0094	.3626	<0.2	.5169	2.1		36.	.1570	.2750	1.133	23.5
2440-2480 27	.0666	.0025	.0120	.2715	<0.2	.3822	2.0		30.	.1223	.2033	.784	16.6
2480-2520 28	.0424	.0020	.0170	.1556	<0.2	.2111	1.7		23.	.0779	.1123	.424	9.2
2520-2560 29	.0278	.0018	.0228	.0816	<0.2	.1002	1.2		19.	.0510	.0533	.233	5.1
2560-2600 30	.0284	.0021	.0162	.0685	<0.2	.0745	.91		17.	.0522	.0396	.217	4.6
2600-2640 31	.0375	.0023	.0092	.0795	<0.2	.0779	.72		18.	.0689	.0414	.152	3.9

AMPAD EFFICIENCY® LINE NO. 6636

	1 % Cu	2 % Mo	3 % Zn	4 % S	5 PPM Ag	6 wt.% py	7 py/cp	8	PPM Co.	10 vol. % cp.	11 vol % pyrite	12 vol. % Fe_3O_4	13 Me
2640-2680 1	.0390	.0023	.0048	.0821	<0.2	.0800	.73		18.	.0716	.0426	.205	4.8
2680-2720 2	.0360	.0022	.0042	.0745	<0.2	.0714	.69		17.	.0661	.0380	.198	4.5
2720-2760 3	.0319	.0022	.0037	.0632	<0.2	.0580	.63		17.	.0586	.0309	.193	4.2
2760-2800 4	.0285	.0024	.0031	.0575	<0.2	.0538	.65		17.	.0523	.0286	.206	4.3
2800-2825 5	.0264	.0025	.0026	.0559	<0.2	.0547	.72		17.	.0485	.0291	.210	4.3
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AMPAD EFFICIENCY® LINE NO. 6636

THIN SECTION SUMMARY HOLE J-5

		PHENOCRYSTS																							
		PLAGIOCLASE								K- FELDSPAR					MAFICS								COMMENTS		
DEPTH	ROCK	ser.	qtz	clay	CO_3	K-spar	biot. (matrix biot)	actin	chl.	ser	qtz	sec. K-sp	chl	other	chl	biot	actin	mag.	rut.	leuc.	other	11	12	13
1403	Yr 1	50	10			10			2		1	3	5		60			40						
1460	Yr 2	70				20			Tr	2	2		3	3-CO_3	60			30						
1495	Yr 3	50	?	?					2	1	3	?	1.0	15-clay	90			10				abundant (10-15%) chlorite		
1545	db 4						35									90		10				10% quartz (secondary?)		
1553	Yr 5	Tr		✓		15	30				?		5	clay	90			✓				qtz-chl vnlt in Yr becomes qtz-biot in db.		
1553	db 6		✓				70									90		10				qtz-biot rock w/ magnetite		
1606	Yr 7	60			4	8	10					?			30	60		8				chl. in matrix may have been biot		
1631	III 8	90													100							much K-spar may be second.		
1654	III 9	80	10						Tr						100							seric. & second. K-spar in matrix.		
1690	Yr 10	65				5			10		3		3		100			✓		✓	py			
1715	db 11	8														?	?	5						
1728	Ttc 12	80				8			5		Tr		Tr	Tr-CO_3	100			✓		✓				
1733	Yr ? 13	70				5			8						100			✓		✓	py			
1749	III 14	✓	✓												✓					✓	py	Texture destroyed. qtz-seric.-chl-biot.-py-leucox-k-spar.		
1764	III 15	35					Tr		5							100		✓		✓		locally biot 100% & chl. abdt. sec. biot in matrix		
1799	Yr 16	20					20		Tr	(10)	20			20-b	20	80								
1816	Yr 17	60				10			Tr	(Tr)			Tr		100			✓		✓				
1844	db 18	15														5								
1882	db 19	40					20	Tr								✓	50					biot. is prob. 2nd after actinolite		
1921	db 20							50									10	✓			2nd K aff. py			
1967	db 21						5	5								✓	50	✓				pyroxene 50 → actinolite 50 → biot & mag.		
1989	III 22	80				12			5						100							sec. K-spar in matrix		
2031	III 23	90				5			Tr						100			✓			py	sec K-spar & biot in mat.		
2038	db 24	60					20	5								50	10					sec. biot - 30% added. Tr. K-spar.		
2079	db 25	40															15							
2096	db 26						10	20								55	15					biot-mag-sulfide added.		
2104	III 27	35				5			2						100			✓				10% biot added to matrix ~5% chlorite		
2135	III 28	20	20						Tr							100		✓		✓		biot → chl near K-spar. py 10% biot added		
2148	III 29	10	15		4	55			Tr						100			✓		✓		K-spar in matrix 5% chl after 2nd biot in matr		
2204	III 30	12				10	2		Tr							100		✓		✓		sec. K-spar & biot in matrix		
2250	III 31	80	Tr				10									100		✓				sec. biot - K-spar, kfs in mat		
2265	Yr	50				5			40	5	5		5	Tr CO_3	30						50-mag			
2282	Yr	68	7			15			10			✓	2		100							dk. olive green aff. of plag. in seric + chl - qtz		
2352	Tmr	40					7		10						70			20	10			abdt. 2nd biot & chl in matrix		
2382	Tmr 1	80	5			10			Tr						100							do. w/ sec. biot → chl		
2431	Tmr 2	15					10								100			✓				20% chl in mat after 2nd biot		
2435	db 3	40		Tr ?											40	50		✓				abdt 2nd biot going to chl		
2454	Tmr 4	20		40 ?											100			✓			Tr CO_3	biot & chl in matrix		
2485	Ttc 5	15		3											100					✓				
2497	Ttc 6	6													100					✓				
2536	Ttc 7	5		Tr											Tr.						Tr Epid.			
2588	Ttc 8	5				5									55									
2600	Ttc 9			25											55							matrix plag → clay mafic → chl.		
2660	Ttc 10	50	←	30 →											100				✓			" plag → seric		
2691	Ttc 11	11													45						Tr. CO_3 Epid			
2716	Ttc 12	50			10										95				✓	✓				
2737	Ttc 13			20							Tr (deuteric?)				12							FRESH ROCK ?		
2768	Ttc 14	15		15	5										100				✓	✓				
2780	Ttc 15	5		15											10									
2793	Ttc 16														10						Tr Epid			

LITTIC

SECTION 15

PROJECT ALVIN DRILL HOLE N 1-6 SCALE 1:720 PAGE NO. 1 OF 2

LENGTH (feet)	Cu	Mo	S	calc. sul % sulfide	Py/cp
35.0	.0037	.0006	.0348	.069	5.4
100.0	.0029	.0005	1.7900	3.344	398.0
52.2	.0033	.0005	.0760	.146	14.3
9.2	.0067	.0009	.0732	.144	6.4
40.0	.0032	.0005	.0655	.126	12.7

DRILLING RATE (minutes/foot) 1 2 3 4 5 6 7 8 9 10

DRILLING - MISCELLANEOUS

- begin drilling with air hammer 5:15 P.M. 4 APR 77
- minor water in hole after sitting one hour.
- first water
- start Tricone - Air
- 2 hrs 00 min
- 0 hrs 51 min
- 4 hrs 26 min
- 2 hrs 05 min

chalcopy, pyrite, molybdite, limonite (zeol), quartz, magnetite, [illegible], [illegible], [illegible], epidote, sericite, white sericite, chlorite

STRUCT. ROCK

LITHOLOGY, ALTERATION & INTERESTING [illegible]

0-720: Precambrian, Oracle Granite: see description below; a significant amount of the interval 0-940 may be brecciated.

PROPYLITIC ALTERATION ASSEMBLAGE: overall plagioclase altered 50% to sericite, 2% to epidote, 1% to secondary K-spar, 1% to chlorite; Primary K-feldspar is altered 35% to secondary K-spar, 2% to chlorite, 2% to sericite plus a trace of epidote; mafic minerals altered 15% to chlorite and 15% to epidote. No secondary biotite noted. Zone contains: .0035% copper, .0006% molybdenum, .33% (weight) total sulfides and has a pyrite + chalcopyrite ratio = 33. Zinc = .0476% compared to .0177% in the interval 520-640 feet, .0394 in the interval 640-1600 feet and .0574 in the interval 1600-1760 feet. Some of the "white sericite" alteration of plagioclase located in the interval 0-760 may actually be montmorillinite see test below.

← montmorillinite test: 80% of sample positive

← pyrolusite dendrites present

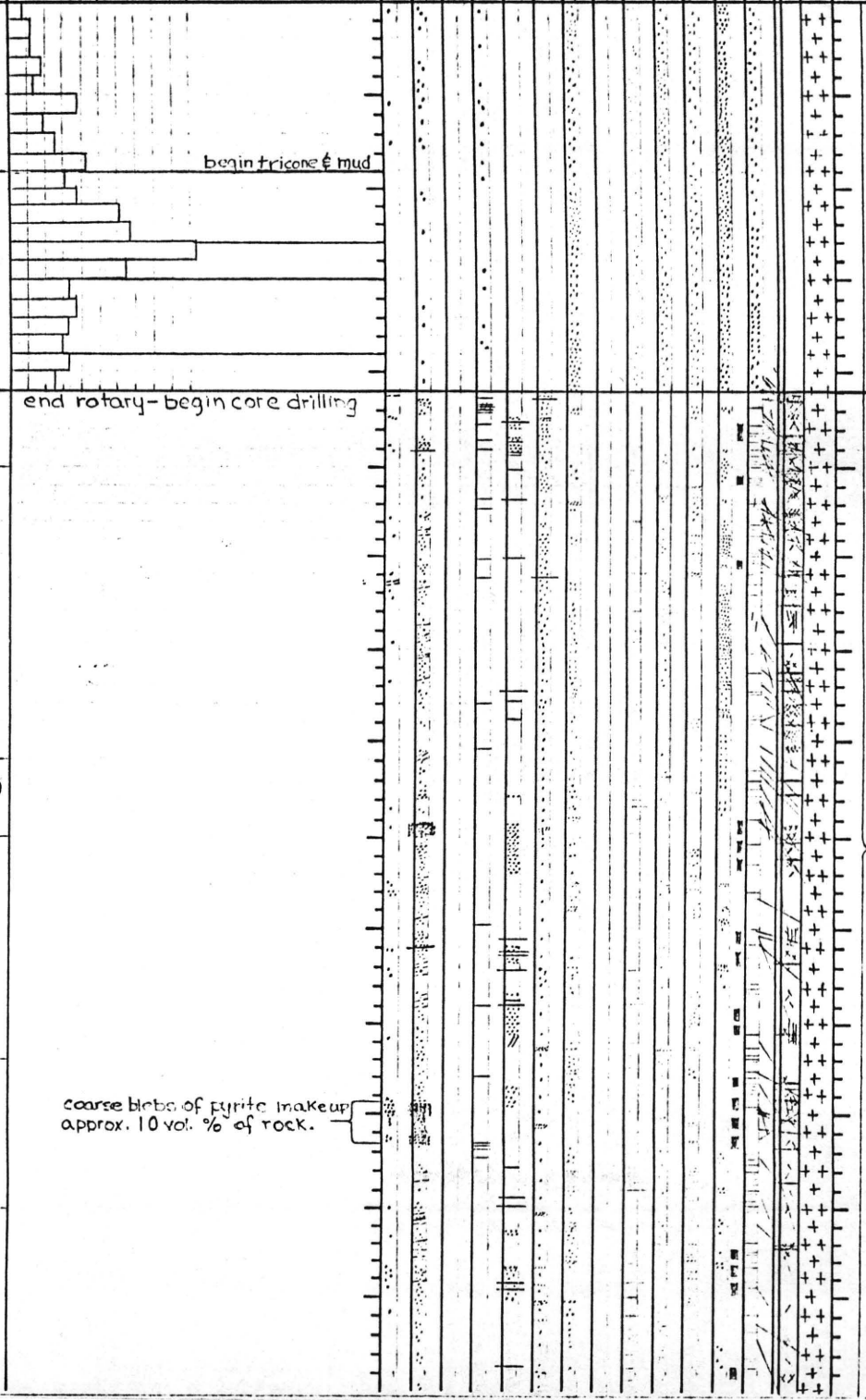
} possible fault zone with important [illegible] 30% of particles are strongly stained & often [illegible] with limonite.

17 ppm cobalt (compared to 12 ppm above this zone and 12 ppm in the interval 640-1600 feet) may be comparable with interval 1600-1760 be[illegible]

720-740: Tertiary Intermediate Melanocratic Rhyodacite Porphyry (?):

PROJECT KELVIN DRILL HOLE No. J-6 SCALE 1" = 100' PAGE NO. 2 OF 4

LENGTH	Drilling Rate (ft/hr)	ASSAYS (%) Cu	Mo	S	Calc. wt. % Sulfide	Py/Cp
800	75.0					
	51.4					
	51.4					
	31.6					
	46.6					
	15.4					
	30.3					
	23.1					
	13.9					
	19.4					
	15.8					
	9.7					
	8.9					
	5.8					
900	9.2	.0028	.0004	.2048	.386	46.7
	17.8					
	15.9					
	18.3					
	20.0					
	17.8					
	22.2					
	0.87	.0044	.0017	.5210	.979	74.9
1000						
	0.53	.0056	.0005	.0562	.111	5.8
1100						
	0.53	.0034	.0006	2.4760	4.626	472.0
1200						
	0.41	.0062	.0005	.2437	.462	24.8
1300						
	0.60	.0091	.0004	.7765	1.462	54.6
1400						
1500	0.56	.0086	.0004	.0584	.118	3.8



LITHOLOGY, ALTERATION / INTERPRETATION

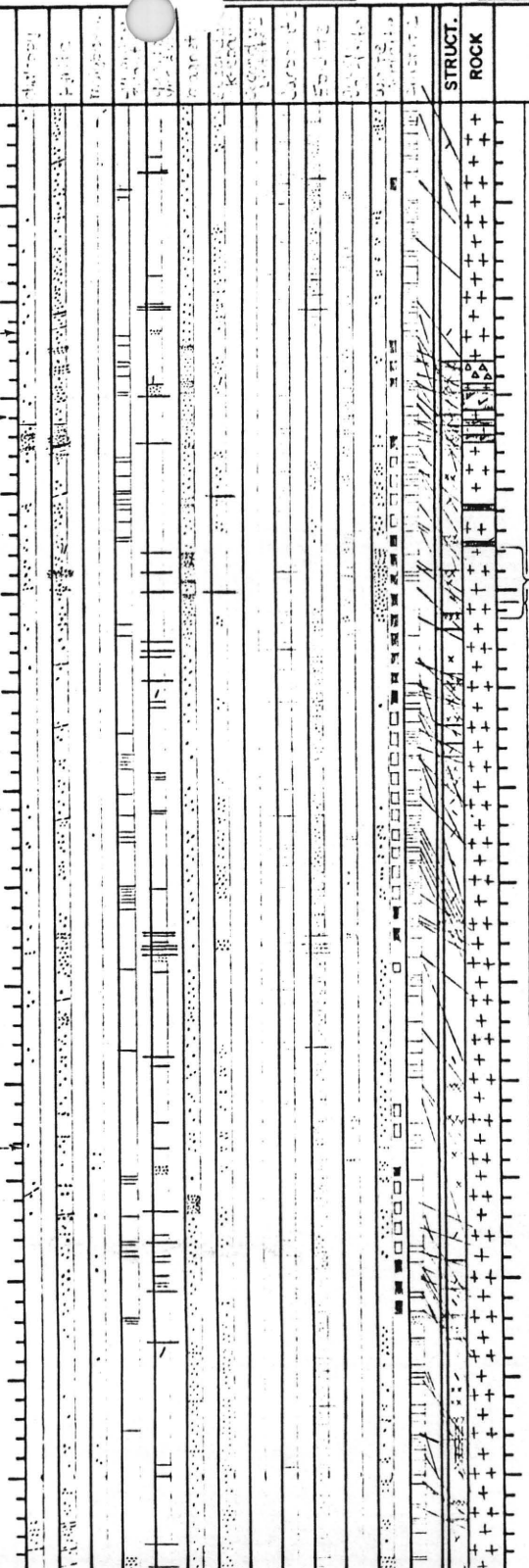
rotary portion logged by [illegible]

740-1633 : Precambrian Oracle Granite : porphyritic quartz monzonite with numerous pink, euhedral k-spar phenocrysts up to 1.5 inch in length; plagioclase crystals, generally euhedral up to 0.25 inch in diameter, in a coarse to medium-grained ground mass of quartz, k-spar, plagioclase, biotite, minor magnetite and hornblende.

PROPYLITIC ALTERATION ASSEMBLAGE : [illegible] close altered 50% to sericite. [illegible] chlorite the traces of carbonate [illegible] Primary [illegible] altered [illegible] chlorite [illegible] traces minerals to clay [illegible] recrystal[illegible] sericite, 60% [illegible] minus trace veins [illegible] trace amounts of carbonate [illegible] biotite is [illegible] (160-1340 feet) [illegible] .731% (weight) total sulfides and has a pyrite + chalcopyrite ratio = 23. Overall there is much more sericite and sulfides and [illegible] carbonate than in the zone described below. Probably very similar to interval 0-520 above - differences may be due to differences in methods of recording observations of core vs. observations of rotary cuttings.

PROJECT KELVIN DRILL HOLE NO. J-6 SCALE 1"=100' PAGE NO. 3 OF 4

LENGTH	Vol.% Fe_3O_4 (comp.)	ASSAYS (%) Cu	Mo	S	Calc. vol. % Sulfide	Py/cp	Mineralization & Miscellaneous
1600							
	1.60	.0256	.0005	.4756	.915	11.4	trace cuprite (?) trace cuprite (?) 18 ppm cobalt magnetite above this zone = 0.48% & below this zone = 0.40 %
1700							
1800							
1900							
2000	0.41	.0047	.0005	.0235	.049	2.6	trace bornite (?) with chalcopyrite
2100							
2200							.0056% zinc (above this zone zinc is extremely variable but averages .0430 %).



Summary Lithology & Alteration Log

1625-1649 Fault breccia composed of Precambrian Oracle Granite

1647-1658
1662-1670
1669-1670
1672-1674
1675-1676
1708-1709
1726-1728

Tertiary-Cretaceous Granodiorite to Quartz M.: approximately 45% phenocrysts (in decreasing order of abundance) [illegible] euhedral to subhedral, up to 0.12" in length, plagioclase (rounded) averaging 0.[illegible] in diameter and biotite & hornblende up to 0.65" in diameter. [illegible] altered magnetite, [illegible] chlorite-epidote. Plag. [illegible]. Narrower intercepts [illegible] coarse-grained & light to medium gray.

1658-1662
1666-1669
1670-1672
1674-1675
1676-1703
1709-1726
1728-2200'±

Precambrian Oracle Granite

Strong "texture destructive" alteration [illegible] half [illegible]. Plagioclase comp[illegible] completely sericitized. 4 vol.% magnetite [illegible] 20% altered [illegible].

PROPYLITIC ALTERATION ASSEMBLAGE: Overall [illegible] altered 15% to [illegible], 5% to [illegible], [illegible] plus trace [illegible] carbonate, epidote and [illegible] feldspar. Primary hydrolysis [illegible] fresh with minor alteration [illegible] carbonate [illegible] 10% in [illegible] carbonate. Sericite and [illegible] 10% to [illegible]. Secondary biotite [illegible] biotite alone showing [illegible]. Zone averages .0006% copper, .0006% [illegible] (summit) and has a [illegible]. Differs [illegible] veining [illegible].

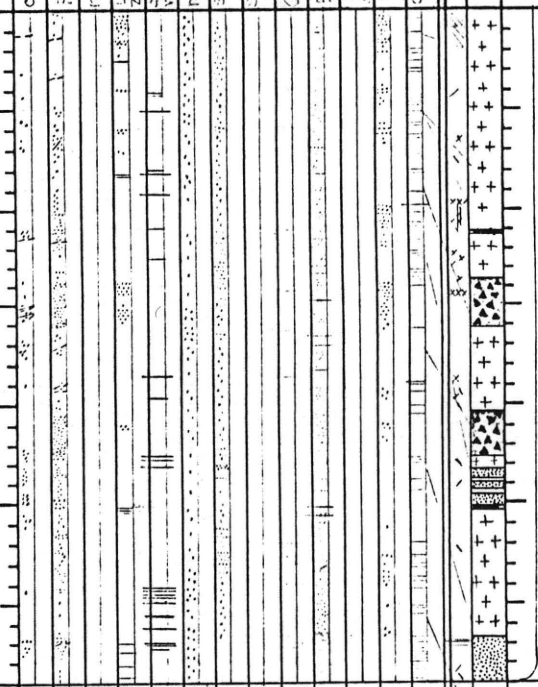
PROJECT KELVIN DRILL HOLE NO. 1-6 SCALE 1" = 100' PAGE NO. 1 OF 1

LENGTH	% Fe_3O_4 (comp)	ASSAYS (%) Cu	Mo	S	calc. tot. % sulfide	Py/CP
2400	0.38	.0070	.0009	.0557	.111	4.5

Mineralization & Miscellaneous

Cobalt from 0-2590 feet ranges from a low of 8 ppm to a high of 32 ppm and averages 13 ppm. local highs may be due to diabase or similar rocks. "Background" value ≈ 12 ppm.

22 ppm cobalt (compared to 11 ppm in the interval 1760-2440 feet).



Summary Lithology & Alteration

2362½-2363½
2387-2411
2454-2474
2501-2503
Cretaceous (?) Intrusive Breccia: angular to subrounded (subordinately) fragments up to 1½" of Precambrian Oracle Granite, diabase, Quartz, K-feldspar & plagioclase in a matrix of angular fragments of quartz, K-feldspar, plagioclase, possible fine-grained clay & interstitial K-spar & pyrite. Crystals not fractured. Matrix is generally dark gray to black. Contacts indicate a clear intrusive emplacement for these rocks. Interpreted to be due to fluidization.

2763½-2787
2411-2434
2474-2499
2503-2510
Precambrian Oracle Granite

2483-2487
2491-2494
2494-2501
2502-2510
Precambrian (?) Fine-Grained Intrusive

date started: 4 APRIL 1977
date completed: 25 MAY 1977
total length : 2590 feet
Hole size:
0-512 : 5⅛ hammer bit
512-518 : 4¾ hammer bit
518-940 : 4¾ tricone (rotary)
940-2590: NQ wireline core
collar location: approximately 250 FWL & 1150 FNL, section 16, T.4 S., R.13 E., Pinal Co., Ariz.
collar elevation: approx. 2450'
inclination : -90° (see note opposite).

Drilling Contractor: LONGYEAR CO.

casing left in hole:
0-21 : 6 inch ID
0-1710 : 3 inch ID.

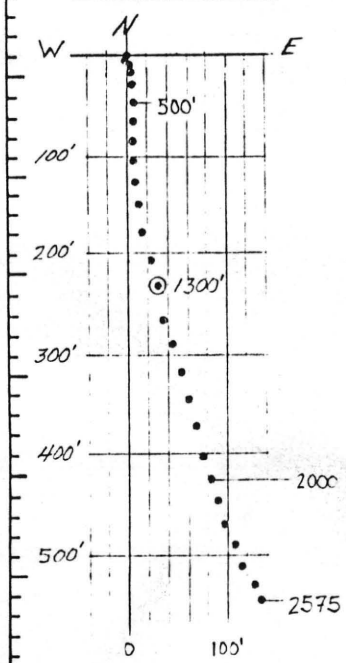
Hole capped with scrap steel set on end of casing.

Average footage/shift = 16.8

Direct drilling cost :	$ 13.10 /ft
Mud, additives, water :	1.03 /ft
Mobilization	.83 /ft
Assaying	.88 /ft
Surveying	.24 /ft
geolograph rental	.23 /ft
Splitting	.23 /ft
Thin sections	.08 /ft
Casing left in hole & rock bits	1.50 /ft
TOTAL	$ 18.12

LOGGED BY: J.P. VROMAN

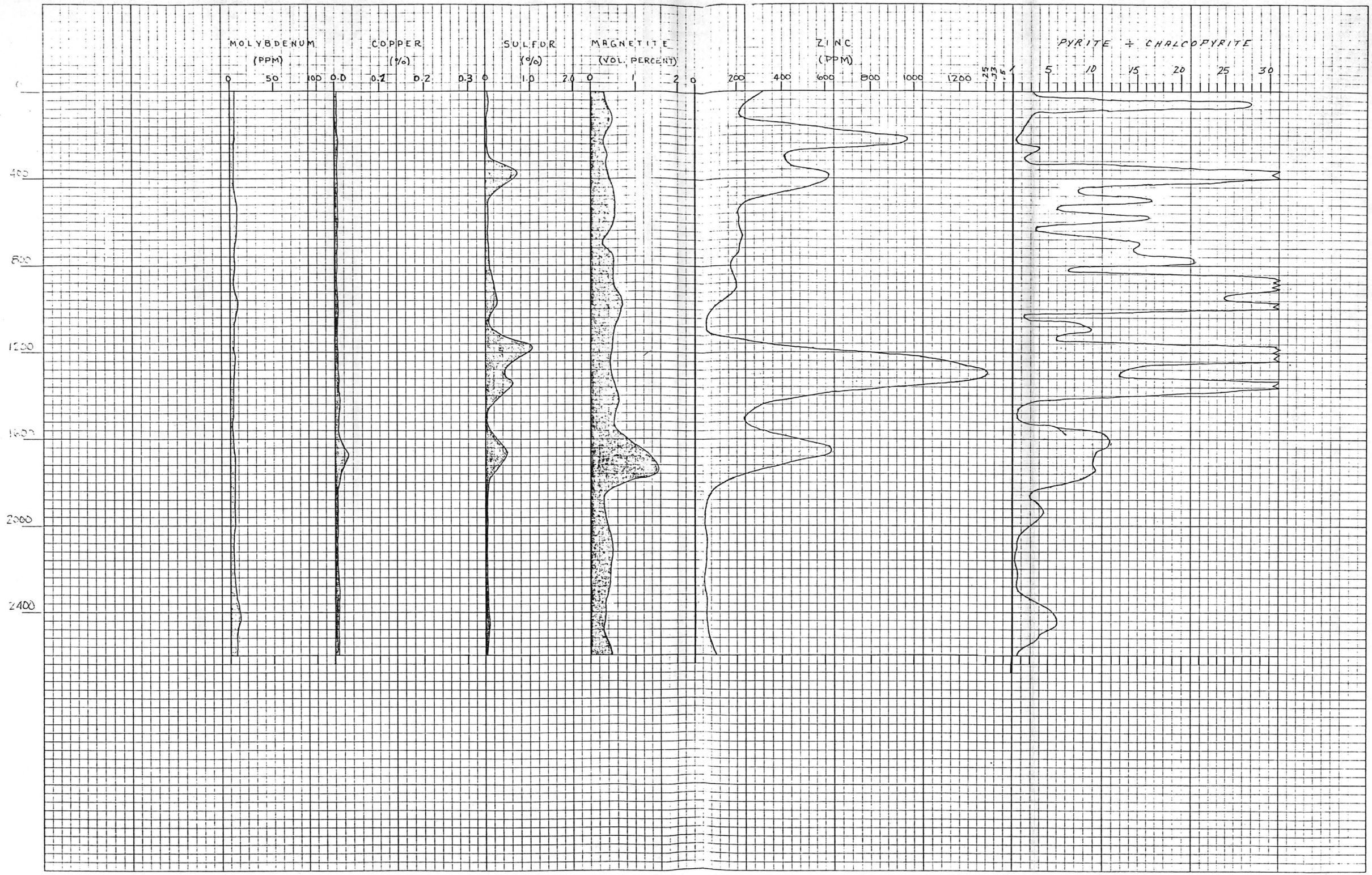
GYROSCOPIC HOLE SURVEY (1" = 200')



NOTE: The hole was drilled from surface to 1710 feet with a rotary rig. A core rig was moved on site & due to cracked and broken casing could not get back on bottom. The hole was wedged off (approximately 6½°) at 940 feet (at a break in the 3 inch casing) and drilling proceeded inside the 3 inch casing, to 2590 feet with NQ wireline tools. Due to the hole problems a directional survey was run in the hole on 5/25/77 - the results of which are plotted to the immediate left.

Rotary (0-1710) ft/shift = 40.7
Core (940-2590) ft/shift = 24.3
exclusive of mobilization-rig-up time & time between end of rotary drilling (at 1710') and start of core drilling (at 940'). The latter time was approx. 13 d

Hole bottom is 514 feet south and 138 feet east of the collar. Total length is 2590 feet. Total Depth is 2519 feet.



47 0700

K+E 10 X 10 TO THE INCH • 10 X 15 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

C.S.M.C. KELVIN PROJECT - HOLE J-6

INTERVAL	ASSAY 1 % Cu	2 wt. % Cp	3 % S in Cp	ASSAY 4 % S	5 % S in py	6 wt % py	TOTAL WT. SULFIDES	8 Py/Cp	ASSAY 9 % Mo	10 % Fe_3O_4	ASSAY 11 % Zn	12		13 PPM Co
1320-1360 1	.0111	.0321	.0112	1.2765	1.2653	2.3672	2.399	73.7	.0004	.600	.1448			18
1360-1400 2	.0071	.0205	.0072	.2765	.2693	.5038	.524	24.6	.0004	.598	.0217			12
1400-1440 3	.0112	.0324	.0113	.0990	.0877	.1641	.196	5.1	.0005	.650	.0502			12
1440-1480 4	.0098	.0283	.0099	.0350	.0251	.0470	.075	1.7	.0004	.553	.0237			12
1480-1520 5	.0111	.0321	.0112	.0385	.0273	.0511	.083	1.6	.0004	.607	.0125			12
1520-1560 6	.0049	.0142	.0049	.0490	.0441	.0825	.097	5.8	.0002	.490	.0296			12
1560-1600 7	.0059	.0170	.0060	.0705	.0645	.1207	.138	7.1	.0004	.502	.0378			10
1600-1640 8	.0046	.0133	.0046	.3225	.3179	.5948	.608	44.7	.0004	.984	.0473			16
1640-1680 9	.0672	.1941	.0678	1.0100	.9422	1.7628	1.957	9.1	.0006	1.679	.1113			22
1680-1720 10	.0084	.0243	.0085	.0910	.0825	.1543	.179	6.3	.0007	.726	.0119	↓	↑	10
1720-1760 11	.0220	.0635	.0222	.4790	.4568	.8546	.918	13.5	.0004	3.014	.0587	430	13	22
1760-1800 12	.0048	.0139	.0048	.0275	.0227	.0425	.056	3.1	.0007	.514	.0038	56	13	10
1800-1840 13	.0064	.0185	.0065	.0300	.0235	.0440	.062	2.4	.0006	.230	.0051	↓		10
1840-1880 14	.0057	.0165	.0058	.0235	.0177	.0331	.016	2.0	.0005	.315	[illegible]			12
1880-1920 15	.0048	.0139	.0048	.0395	.0347	.0649	.079	4.7	.0006	.358	.0068			12
1920-1960 16	.0050	.0144	.0050	.0525	.0475	.0889	.103	6.2	.0007	.311	.0039			12
1960-2000 17	.0034	.0098	.0034	.0190	.0156	.0292	.039	3.0	.0006	.423	.0044			10
2000-2040 18	.0037	.0107	.0037	.0175	.0138	.0258	.037	2.4	.0006	.304	.0054			12
2040-2080 19	.0040	.0116	.0040	.0065	.0025	.0047	.016	.41	.0004	.615	.0051			12
2080-2120 20	.0050	.0144	.0050	.0240	.0190	.0355	.050	2.5	.0004	.403	.0057			12
2120-2160 21	.0037	.0107	.0037	.0090	.0053	.0099	.021	.93	.0004	.518	.0056			12
2160-2200 22	.0055	.0159	.0056	.0050	—	—	.016	—	.0004	.441	.0050			8
2200-2240 23	.0060	.0173	.0061	.0340	.0279	.0522	.069	3.0	.0006	.458	.0043			10
2240-2280 24	.0037	.0107	.0037	.0170	.0133	.0249	.036	2.3	.0006	.435	.0040			8
2280-2320 25	.0030	.0087	.0030	.0295	.0265	.0496	.058	5.7	.0008	.443	.0029			10
2320-2360 26	.0043	.0124	.0043	.0385	.0342	.0640	.076	5.2	.0005	.316	.0080			10
2360-2400 27	.0060	.0173	.0061	.0740	.0679	.1270	.144	7.3	.0008	.287	.0049			12
2400-2440 28	.0096	.0277	.0097	.0710	.0613	.1147	.142	4.1	.0020	.495	.0040			12
2440-2480 29	.0061	.0176	.0062	.1225	.1163	.2176	.235	12.4	.0006	.298	.0051			16
2480-2520 30	.0112	.0324	.0113	.0295	.0182	.0341	.066	1.1	.0008	.250	.0094		22	30
2520-2560 31	.0042	.0121	.0042	.0615	.0573	.1072	.119	8.9	.0008	.476	.0052			12
2560-2590	.0117	.0338	.0118	.0190	.0072	.0135	.047	.40	.0008	.490	.0110			32

AMPAD EFFICIENCY, LINE NO. 6636

CSMC KELVIN PROJECT . HOLE J-6

FIVE POINT WEIGHTED RUNNING AVERAGES

0-960 = ROTARY CUTTINGS : 960 – 2590 = CORE

INTERVAL	1 % Cu	2 % Mo	3 % Zn	4 % S	5	wt % py	7 py/cp	8	9	10 Vol. % cp (Cu x 1.8363)	11 Vol % py (wt. py x .532)	12 Vol % Fe_3O_4	13 Mc
0-40 1	.0026	.0006	.0285	.0487		.0851	11.3			.0048	.0453	.312	5.4
40-80 2	.0028	.0006	.0235	.0570		.1014	12.5			.0051	.0539	.388	6.7
80-120 3	.0032	.0006	.0210	.0403		.0694	7.5			.0059	.0369	.458	7.5
120-160 4	.0038	.0006	.0377	.0262		.0419	3.8			.0070	.0223	.449	7.2
160-200 5	.0045	.0006	.0715	.0198		.0286	2.2			.0083	.0152	.352	5.6
200-240 6	.0047	.0006	.0974	.0205		.0296	2.2			.0086	.0157	.302	4.9
240-280 7	.0043	.0005	.0642	.0251		.0389	3.1			.0079	.0207	.338	5.5
280-320 8	.0040	.0005	.0412	.1676		.3061	26.5			.0073	.1628	.382	8.3
320-360 9	.0034	.0005	.0442	.4508		.8370	85.2			.0062	.4453	.369	12.3
360-400 10	.0031	.0005	.0618	.7294		1.3588	151.7			.0057	.7229	.393	16.8
400-440 11	.0031	.0005	.0563	.4713		.8760	97.8			.0057	.4660	.462	14.0
440-480 12	.0037	.0006	.0392	.2037		.3742	35.0			.0068	.1991	.510	10.7
480-520 13	.0042	.0007	.0268	.0747		.1319	10.9			.0077	.0702	.522	9.0
520-560 14	.0052	.0009	.0204	.0752		.1308	8.7			.0095	.0696	.543	9.3
560-600 15	.0056	.0009	.0206	.0726		.1252	7.7			.0103	.0666	.520	9.0
600-640 16	.0060	.0008	.0210	.0651		.1104	6.4			.0110	.0587	.441	7.7
640-680 17	.0047	.0007	.0228	.0608		.1050	7.7			.0086	.0559	.378	6.6
680-720 18	.0036	.0006	.0216	.0612		.1190	11.4			.0066	.0633	.262	5.0
720-760 19	.0031	.0005	.0204	.0737		.1321	14.8			.0057	.0703	.460	8.0
760-800 20	.0031	.0005	.0172	.0947		.1714	19.1			.0057	.0912	.507	9.1
800-840 21	.0033	.0005	.0176	.1382		.2524	26.5			.0061	.1343	.494	9.5
840-880 22	.0030	.0004	.0197	.1962		.3615	41.7			.0055	.1923	.477	10.1
880-920 23	.0030	.0005	.0200	.2048		.3775	43.6			.0055	.2008	.536	11.1
920-960 24	.0037	.0008	.0158	.2288		.4211	39.4			.0068	.2240	.656	13.3
960-1000 25	.0050	.0010	.0098	.2532		.4643	32.1			.0092	.2470	.704	14.4
1000-1040 26	.0061	.0008	.0068	.1659		.2990	17.0			.0112	.1591	.635	12.1
1040-1080 27	.0058	.0006	.0060	.0958		.1684	10.1			.0107	.0896	.581	10.2
1080-1120 28	.0050	.0005	.0063	.2491		.4567	31.6			.0092	.2430	.530	11.7
1120-1160 29	.0043	.0005	.0218	.6431		1.1951	96.2			.0079	.6358	.508	17.3
1160-1200 30	.0043	.0005	.0546	1.0781		2.0090	161.7			.0079	1.0688	.482	23.4
1200-1240 31	.0051	.0006	.1034	.7866		1.4621	99.3			.0094	.7778	.442	18.4
1240-1280	.0065	.0005	.1192	.4844		.8939	47.6			.0119	.4756	.429	13.7
1280-1320	.0076	.0005	.1293	.4412		.8110	36.9			.0140	.4315	.468	13.7

ROTARY

CORE

1.8363

INTERVAL	1 % Cu	2 % Mo	3 % Zn	4 % S	5	6 wt. % py	7 py/cp	8 wt % py	9 py/cp	10 vol. % cp	11 vol. % py	12 vol. % Fe_2O_3	13 MC
1320-1360 1	.0088	.0004	.1083	.6074		1.1198	44.1			.0162	.5957	.546	17.4
1360-1400 2	.0091	.0004	.0650	.4370		.8004	30.5			.0167	.4258	.593	15.5
1400-1440 3	.0099	.0004	.0419	.2110		.3761	13.2			.0182	.2001	.608	12.4
1440-1480 4	.0098	.0004	.0275	.0702		.1128	4.0			.0180	.0600	.586	10.0
1480-1520 5	.0090	.0004	.0239	.0472		.0713	2.7			.0165	.0379	.563	9.3
1520-1560 6	.0068	.0003	.0285	.0715		.1209	6.2			.0125	.0643	.563	9.6
1560-1600 7	.0105	.0004	.0418	.1935		.3422	11.3			.0193	.1821	.709	13.7
1600-1640 8	.0196	.0005	.0558	.3842		.6818	12.0			.0360	.3627	.975	20.6
1640-1680 9	.0310	.0005	.0639	.5262		.9259	10.3			.0569	.4926	1.311	27.9
1680-1720 10	.0245	.0006	.0478	.4055		.7124	10.1			.0450	.3790	1.477	28.5
1720-1760 11	.0172	.0006	.0352	.2916		.5131	10.3			.0316	.2730	1.592	28.4
1760-1800 12	.0095	.0006	.0178	.1368		.2380	8.7			.0174	.1266	1.026	17.6
1800-1840 13	.0069	.0006	.0099	.0632		.1052	5.3			.0126	.0560	.539	9.1
1840-1880 14	.0055	.0006	.0068	.0312		.0480	3.0			.0101	.0255	.320	5.3
1880-1920 15	.0051	.0006	.0063	.0365		.0587	4.0			.0094	.0312	.332	5.6
1920-1960 16	.0045	.0006	.0052	.0368		.0604	4.6			.0083	.0321	.347	5.5
1960-2000 17	.0040	.0006	.0048	.0270		.0430	3.7			.0073	.0229	.379	6.1
2000-2040 18	.0039	.0005	.0050	.0185		.0273	2.4			.0072	.0145	.411	6.5
2040-2080 19	.0041	.0005	.0053	.0142		.0189	1.6			.0075	.0101	.472	7.3
2080-2120 20	.0044	.0004	.0055	.0145		.0189	1.5			.0081	.0101	.474	7.4
2120-2160 21	.0046	.0004	.0053	.0133		.0163	1.2			.0084	.0087	.477	7.4
2160-2200 22	.0050	.0005	.0050	.0150		.0187	1.3			.0092	.0099	.459	7.2
2200-2240 23	.0060	.0005	.0044	.0211		.0283	1.6			.0110	.0151	.452	7.2
2240-2280 24	.0076	.0006	.0042	.0245		.0316	1.4			.0140	.0168	.433	7.0
2280-2320 25	.0094	.0007	.0046	.0325		.0432	1.6			.0173	.0230	.401	6.6
2320-2360 26	.0081	.0008	.0055	.0455		.0670	3.0			.0149	.0356	.362	6.2
2360-2400 27	.0073	.0010	.0053	.0654		.1085	5.1			.0134	.0577	.355	6.4
2400-2440 28	.0077	.0012	.0052	.0779		.1312	5.9			.0141	.0698	.369	6.8
2440-2480 29	.0079	.0010	.0058	.0807		.1360	6.0			.0145	.0724	.345	6.5
2480-2520 30	.0083	.0008	.0071	.0607		.0979	4.1			.0152	.0521	.351	6.3
2520-2560 31	.0080	.0008	.0077	.0480		.0747	3.2			.0147	.0397	.408	6.7
2560-2590	.0091	.0008	.0089	.0343		.0470	1.8			.0167	.0250	.459	7.5

AMPAD EFFICIENT® LINE NO. 8836

in rotary portion
* average meter reading x 0.75
(factor determined by comparison of core to cuttings 960-1710)

C.S.M.C. KELVIN PROJECT - HOLE J

INTERVAL	1 % Cu (ASSAY)	2 wt. % Cp	3 % S in cp.	4 % S (ASSAY)	5 % S in py	6 wt % py	7 TOTAL WT SULFIDES	8 Py/CP	9 % Mo (ASSAY *)	10 % Fe_3O_4	11 % Zn (ASSAY)	12	13 PPM C
0 - 40 1	.0026	.0075	.0026	.0170	.0144	.0269	.034	3.6	.0006	.240	.0336		10
40 - 80 2	.0025	.0072	.0025	.1110	.1085	.2030	.210	28.2	.0006	.360	.0247		20
80-120 3	.0032	.0092	.0032	.0200	.0168	.0314	.041	3.4	.0006	.525	.0145		12
120-160 4	.0033	.0095	.0033	.0175	.0142	.0266	.036	2.8	.0006	.570	.0138		12
160-200 5	.0050	.0144	.0050	.0215	.0165	.0309	.045	2.1	.0007	.285	.0517		[illegible]
200-240 6	.0055	.0159	.0056	.0175	.0119	.0222	.038	1.4	.0005	.195	.1974		10
240-280 7	.0034	.0098	.0034	.0245	.0211	.0395	.049	4.0	.0005	.330	.0229		10
280-320 8	.0050	.0144	.0050	.0230	.0180	.0337	.048	2.3	.0005	.525	.0156		10
320-360 9	.0030	.0087	.0030	.0610	.0580	.1085	.117	12.5	.0006	.285	.0299		[illegible]
360-400 10	.0029	.0084	.0029	1.7900	1.7871	3.3435	3.352	398.0	.0005	.315	.0987		14
400-440 11	.0027	.0078	.0027	.0920	.0893	.1671	.175	21.4	.0004	.525	.0596		10
440-480 12	.0040	.0116	.0040	.0500	.0460	.0861	.098	7.4	.0006	.570	.0257		10
480-520 13	.0032	.0092	.0032	.0860	.0828	.1549	.164	16.8	.0006	.435	.0307		12
520-560 14	.0071	.0205	.0072	.0735	.0663	.1240	.145	6.0	.0010	.585	.0110		22
560-600 15	.0029	.0084	.0029	.0780	.0751	.1405	.149	16.7	.0010	.615	.0251		14
600-640 16	.0101	.0292	.0102	.0680	.0578	.1081	.137	3.7	.0008	.420	.0169		16
640-680 17	.0031	.0090	.0031	.0435	.0404	.0756	.085	8.4	.0006	.240	.0283		12
680-720 18	.0028	.0081	.0028	.0685	.0657	.1229	.131	15.2	.0005	.480	.0172		12
720-760 19	.0036	.0104	.0036	.0855	.0819	.1532	.164	14.7	.0006	.405	.0273		12
760-800 20	.0022	.0064	.0022	.0760	.0738	.1381	.144	21.6	.0005	.585	.0115		12
ROTARY 800-840 21	.0044	.0127	.0044	.0540	.0496	.0928	.105	7.3	.0005	.525	.0144		12
840-880 22	.0026	.0075	.0026	.3635	.3609	.6752	.683	90.0	.0004	.405	.0241		16
880-920 23	.0024	.0069	.0024	.1220	.1196	.2238	.231	32.4	.0004	.420	.0227		12
920-960 24	.0033	.0095	.0033	.1290	.1257	.2352	.245	24.8	.0005	.750	.0187		10
CORE 960-1000 25	.0044	.0129	.0045	.5210	.5165	.9662	.979	74.9	.0017	.874	.0042		12
1000-1040 26	.0083	.0240	.0084	.0375	.0291	.0544	.078	2.3	.0006	.486	.0069		10
1040-1080 27	.0053	.0153	.0053	.0655	.0602	.1126	.128	7.4	.0005	.655	.0067		10
1080-1120 28	.0050	.0144	.0050	.0810	.0760	.1422	.157	9.9	.0006	.482	.0031		10
1120-1160 29	.0040	.0116	.0040	.0410	.0370	.0692	.081	6.0	.0004	.478	.0104		10
1160-1200 30	.0034	.0098	.0034	2.4760	2.4726	4.6260	4.636	472.0	.0006	.533	.0088		10
1200-1240 31	.0050	.0144	.0050	.4185	.4135	.7736	.788	53.7	.0006	.412	.1890		14
1240-1280	.0070	.0202	.0071	.1760	.1689	.3160	.336	15.6	.0005	.390	.0649		14
1280-1320	.0066	.0191	.0067	.1365	.1298	.2428	.262	13.0	.0005	.420	.1681		12

7 % / 1 kspar / 1 CO3 / 1 epi

1950 – 1750 } 62% sericite, 10% clay, 2 chlorite

AMPAD EFFICIENCY LINE NO. 6636

do alt. of I Bx

quartz – ✓ when see chosen 4

DEPTH	ROCK	PLAGIOCLASE 1	clay	chl	CO_3	epi	K-spar 3	K-SPAR ser.	clay	chl.	CO_3	epi	K-spar	qtz	mag 7	MAFICS ser	chl	mag	CO_3	clay	epi	qtz	biot	COMMENTS cat. qtz.	12	13	JAH
958	Yr 1	100		some				some		min							60				40						
971	2	80		min	✓												80	10						X			
991	3	20			5.											?	60	20		20?							
011	4	90	?													20	50	20									
043	5	some	95														50				10			X			
057	6	99						5		5						10	60	20						X			
098	7		70								cem.	some		some			70				20						
142	8	80	8	Tr	12						10					15	70	5									
158	9	28	15?										some				11										X
194	10	95		Tr				10		5							100										X
207	11	95		4						10							100										X
238	12	15?	80	2	5					5	20						80			20							X
264	13	30										3				30	40		10		10			X			
327	14	60 →			5											10	70		10								
345	15	70	20	10				50	15	30	2			2		←	100							Texture Destroying alter.			X
406	16	100			min											10	70	10									
409	17	40				min		min								10	60	5	5		10						
452	18	65 →															100		min					X			
495	19	18	?			5						Tr					70				30						X
508	20	10	40																		40						X
541	21																							eptdote added			X
608	22	25	?														12				18						X
628	Yr 23	90		10	10			70		10	10																X
642	Yr Bx 24	90						40		30					25		80	15									X
657	II 25	90		10												20	70										X
708	Yr 26	70		10			20																				X
734	27	95						5		20	Tr				5		80	20									X
783	28	20								4	Tr				2		60	40									X
827	29	45					min			2							6						70				X
855	30	12			4						5					30	10		10	5							X
912	31	40		15												20	40		10	?							X
928		0																									X
940		30		30													60				30						X
981		18		25													40				15						X
2044	1	15		Tr								2		2			30				60	10					X
2062	2	2										4						20					50	Bio single metamorphic recrystallization of primary along cleavage			X
2082	3	5	20														5						50				
2102	4	5	5														20			50?	5						
2138	5	10				5											70	5			20						
2143	6	20				2						2					65	10			15						
2223	7	20				1	1			5		10				10	30				10						
2259	8		40														20 →				→						
2340	Yr 9	10				1						✓					100				→						
2389	I Bx 10																										
2400	11																										
2405	12																										
2463	I Bx 13																										
2486	46/pot 14			5													25							Trace of Qtz Cb – hardly			
2562	30/pot			Tr													18				✓						
2534	Yr 16	10								5		5					100 →				→						
2560	db 17																										
2584	db 18		70														25										
Yr 1783–2584	19	15	4	4	Tr	Tr	Tr	0	0	Tr	Tr	1		Tr	Tr												

SECTION 16

	1	2	3	4	5	6	7	8	9	10	11	12	13
Thallium[1]	all results < 10 ppm												
Tellurium[2]	high population in			J2	1300-1700	(>100 ppm)	(remaining values, except 1, < 30 ppm)						
Indium 3	high population in			J3	160-560	4 values (mean) = 34.5	(median of remaining = 12 ppm)						
4				J6	480-640								
Tin 5	low population in			J4	1720-3104	(mean = 11.3 ppm)	(median of remainder = 22.5 ±)						
Iron 6	low population in			J6	1840-2590								
7	high " in			J1									
8				J2									
9				J4									
10				J5: 1640-2520									
Lead 11	high population related to faults (J2: 1300-1400, 2680-2760 & J5: 1480-1560)												
12			and in	KM-6	19'-500								
13				J2	200-300		may describe zone in upper block						
14				J3	160-560		dipping westerly						
15				J4	600-920								
16	high population in			KM-6									
17				J1 :	500-2478								
18	low population in			J4 :	1800-3000								
19				J5 :	2120-2825								
Copper 20	low population in			J6 :	0-1200								
21	high population in			J1 :	1900-2400	(500')							
22				J4 :	2360-3000	(640')							
23				J5 :	1800-2600	(800')							
Molybdenum 24	lowest population in			J6									
25	low " in			J3:	16-1680, 2880-2960								
26				J4:	600-1960, 3000-3104								
27	high population "			J5:	2120-2825								
Silver 28	high population ~ scattered & possibly related to post mineral faults												
29	low population in			J6									
Tungsten 30	low population in			J4:	1640-1880		may be more subtle						
31					2920-3104		differences - possible recheck						
	high pop (possible)			J1 :	1200-1600		(see J5 for example)						
				J6:	480-720								

	1	2	3	4	5	6	7	8	9	10	11	12	13
cobalt 1	high	population	in	J4:	2040-	3000							
2				J5:	1640-	2440							
3	low	population	in	KM-6									
4				J6:	80-1200	& 1840-2590							
Arsenic	less	than	6% of	samples "anomalously high" – these values are mostly scattered									
6		possible	high	in	J3:	2080-2800							
Nickle 7	high	population	in	J4	1640-	2600							
8				J5	1640-	2600							
9	low	population	in	KM-6									
10				J3									
11				J5:	1440-	1640							
12				J6:	1840-	2590							
ZINC 13	high	population	in	J2:	1300-	1400	fault ?						
14				J3:	160-	2960							
15				J4:	3000-	3104	fault ?						
16				J5:	1440-	1560	fault ?						
17				J6:	1200-	1840							
18	low	population (?)	in	J1:	1200-	1700	– upper block (move S w.r.t. J2-J4 ?)						
19				J2:	1500-	2200	middle block						
20				J4:	1720-	2680							
BISMUTH 21	high	population	in:	fault related zones									
22	"	"	"	middle block									
23	"	"	"	lower part of upper block hole J1 & J3 ??									
24													
25													
26													
27													
28													
29													
30													
31													

KM-6

	>3.3	Fe_3O_4	2 Mo	3 Ag	Ni	4 Co	5 Mn	6 Fe	7 Cu	8 Zn	9 Pb	10 Sn	Bi	11 WO_4	12 As	In	13 Te	Tl
			✓	✓	✓	✓	✓	✓ %	✓ %	✓	✓	✓	✓	✓	✓	✓	✓	✓
19-100 1	.17	.10	90	4	15	30	21,200	16.5	.2690	690	310	50	17	68	-80	4	-10	-10
100-200 2	.13	.22	60	5	40	40	35,500	22.0	.0500	1900	460				-100			
400-500 3	.18	.06	30	4	-15	30	105,000	20.7	.1430	1465	1585	>100	12	86	-80	4	-10	-10

4
5
6
7
8
9
10
11
12
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14
15
16
17
18
19
20
21 J1-J6, KM6:
22
23 All Tl assays < 10 ppm
24
25
26
27
28
29
30
31

J1

	int% >3.3	wt% Fe_3O_4	2 Mo	3 Ag	Ni	4 Co	5 Mn	6 Fe %	7 Cu %	8 Zn	9 Pb	10 Sn	Bi	11 WO_4	12 As	In	13 Te	Tl
15-100 1	1.4	1.7	270	18	30	320	24,000	15.1	2.58	3800	180	76	11	>200	-50	5	-10	-10
100-200 2	.98	.52	340	18	50	700	4050	28.5	2.90	775	260	26	11	160	-50	5	-10	
200-300 3	.65	1.0	820	12	70	990	10,400	29.5	2.25	3225	410	35	10	140	-50	10	-10	
300-400 4	.49	1.1	2920	18	60	740	12,200	27.6	2.25	1150	740	58	10	140	-50	14	-10	
400-500 5	.99	.83	820	35	100	730	3625	28.5	4.99	2600	320	20	10	110	-50	10	-10	
500-600 6	.54	.81	860	38	60	440	10,300	24.6	7.32	1125	190	35	13	70	-50	7	-10	
600-700 7	.42	1.2	990	6	69	505	24,400	25.0	1.93	57	80	49	6	64	-50	13	-10	
700-800 8	.61	.81	190	15	50	520	13,500	25.9	2.38	7750	540	68	13	130	-50	9	-10	
800-900 9	.39	.89	120	8	60	620	17,200	26.0	1.45	50	120	65	13	110	-50	10	-10	
900-1000 10	.49	.62	350	15	80	300	12,600	24.1	3.89	2225	220	64	13	120	-50	10	-10	
1000-1100 11	.39	.36	60	20	80	340	11,800	27.5	1.95	725	200	66	12	130	-50	8	-10	
1100-1200 12	.39	.21	650	18	110	550	15,000	31.9	4.85	4925	190	48	17	120	-50	6	-10	
1200-1300 13	.48	.31	170	10	90	240	21,000	25.4	2.18	50	100	72	32	>200	-50	8	-10	
1300-1400 14	1.3	.14	270	12	80	420	6750	33.5	1.80	75	100	52	70	>200	-50	7	27	
1400-1500 15	.37	.49	145	8	49	180	25,300	25.5	1.71	82	98				-80			
1500-1600 16	.36	.50	255	7	57	245	26,400	25.4	1.89	71	171	>100	15	>200	-80	7	-10	
1600-1700 17	.23	.20	860	15	77	585	15,400	29.4	5.42	38	154	86	14	>200	-80	6	-10	
1700-1800 18	.34	.13	1235	18	58	420	8720	24.7	4.34	145	131				-80			
1800-1900 19	.34	.26	305	11	43	195	8135	29.3	1.22	813	195				-100			
1900-2000 20	.31	.26	200	29	83	200	13,700	26.2	10.8	374	150				-80			
2000-2100 21	1.1	.41	190	78	60	290	4750	31.9	6.65	5700	200	35	52	80	-50	8	-10	
22																		
2200-2300 23	.20	.65	465	28	56	170	32,300	26.0	4.14	316	197				105			
2300-2400 24	.47	.87	1030	29	71	430	15,700	30.2	7.39	286	114	39	13	160	-80	6	-10	
2400-2478 25	.95	.35	780	20	50	140	20,000	36.5	1.25	600	120	34	30	120	-50	7	-10	
26																		
27																		
28																		
29																		
30																		
31																		

	Wt. % >3.3	Wt. % Fe_3O_4	2 Mo	3 Ag	Ni	4 Co	5 Mn	6 Fe %	7 Cu %	8 Zn	9 Pb	10 Sn	Bi	11 WO_4	12 As	In	13 Te	Tl
45-100 1	.93	.60	20	8	.60	50	20,500	14.0	.1625	450	160				-50			
2																		
200-300 3	1.7	.37	110	92	.50	170	36,500	31.5	.4750	1025	1200	9	>100	32	375	6	-10	-
300-400 4	.73	1.3	70	10	60	240	30,200	20.8	.0625	425	220	50	17	18	75	4	-10	-
5																		
1300-1400 6	.60	.24	60	108	60	270	8750	23.2	4.45	77,000	5225	11	>100	70	50	10	92	-
1400-1500 7	.46	.68	1550	18	70	250	19,000	20.5	3.36	200	210	54	>100	80	-50	8	86	-
1500-1600 8	.56	.73	810	30	60	390	6500	29.5	6.52	75	180	22	>100	40	-50	8	>200	-
1600-1700 9	.97	.92	930	15	60	220	4250	30.4	1.08	50	80	30	45	90	-50	7	35	-
1700-1800 10	.36	.31	275	7	55	385	4125	35.6	.7220	205	82				-80			
1800-1900 11	.71	.55	185	14	100	400	5355	32.5	3.04	35	43	20	13	54	-80	5	16	-
1900-2000 12	1.0	.68	360	22	120	430	4250	30.6	5.70	550	240	>100	8	50	-50	6	-10	-
13																		
2018-2040 14	.16	.20	105	13	70	395	2155	24.8	2.16	260	138				-100			
2040-2120 15	.21	.28	120	12	60	550	2380	30.6	1.59	89	131				-70			
2120-2200 16	.20	.41	1130	9	85	690	2830	28.9	.7390	63	113				-70			
2200-2280 17	.13	.30	185	16	85	705	5185	29.0	2.02	210	104				-100			
2280-2360 18	.09	.24	215	15	60	375	7410	24.2	2.47	148	474				-100			
2360-2440 19	.14	.29	590	14	60	350	3675	30.6	.8040	505	165				-100			
2440-2520 20	.10	.30	155	9	70	280	7855	24.0	.8290	130	122				-100			
2520-2600 21	.10	.25	135	8	35	235	11,700	26.8	.5850	500	435				-100			
2600-2680 22	.06	.14	280	8	-30	215	9260	23.9	.2315	310	278				-150			
2680-2760 23	.37	.22	55	936	70	270	2145	31.6	.8750	605	1714	34	100	130	-80	5	>200	-
2760-2840 24	.38	.30	45	14	85	345	1430	33.4	.4285	715	186	9	19	50	-80	4	20	-
2840-2920 25	.27	.32	55	14	45	315	6070	31.1	.2140	70	71	15	9	43	-80	5	-10	-
2920-3014 26	.50	1.3	70	5	60	220	6000	31.2	.1250	500	80	15	5	72	-50	4	12	-
27																		
28																		
0-1400 29			65	54						19,725	1701							
1400-2680 30			468	14						222	186							
2680-3014 31			56							472	513							

J3

	wt % >3.3	wt % Fe_3O_4	2 Mo	3 Ag	Ni	4 Co	5 Mn	6 Fe %	7 Cu %	8 Zn	9 Pb	10 Sb	Bi	11 WO4	12 As	In	13 Te	T
16-80 1	.29	.48	45	7	30	45	16,400	11.8	.0180	605	215	33	13	33	-80	8	-10	-1
80-160 2	.27	.47	230	4	55	615	7145	29.5	.0895	430	70	25	19	68	-80	8	-10	-1
160-240 3	.23	.53	60	146	30	275	14,200	16.9	1.0800	100,000	4045	31	>100	64	75	29	-10	-1
4																		
400-480 5	.17	.18	20	13	60	540	5335	25.0	.2795	36,100	385				-50			
480-560 6	.17	.30	170	54	30	290	19,600	15.2	1.2300	146,000	1370	24	68	30	-80	37	-10	-1
7																		
800-880 8	.22	.56	15	8	15	200	18,800	17.9	.0625	15,800	215	38	15	43	-80	11	-10	-1
9																		
1120-1200 10	.20	.45	30	7	30	170	23,200	17.9	.0715	4070	245	35	19	43	-80	10	-10	-1
11																		
1280-1360 12	.08	.10	20	22	-20	170	2690	18.3	.4030	12,600	280				-100			
13																		
1440-1520 14	.17	.35	20	30	100	480	4000	25.5	.6750	32,600	200	15	54	54	-100	12	-10	-1
1520-1600 15	.14	.31	-10	24	35	110	5500	13.4	.3360	74,900	305				-70			
1600-1680 16	.13	.45	15	10	-15	95	16,600	12.0	.0665	16,300	225				-80			
17																		
2080-2160 18	.08	.25	100	8	15	100	8960	13.0	.0610	4225	260				[illegible]			
2160-2240 19	.12	.22	140	14	15	115	1775	17.0	.3545	25,400	240				140			
2240-2320 20	.49	.39	-10	15	80	670	5000	31.0	.3500	13,300	130	10	28	56	75	7	-10	-1
2320-2400 21	.36	.32	100	43	45	370	3570	28.6	.6430	6565	200	10	56	160	105	19	12	-1
2400-2480 22	.20	.58	400	7	15	130	29,300	15.7	.1250	4465	170	47	10	30	-80	10	-10	-1
23																		
2720-2800 24	.31	.38	190	30	40	340	8500	28.5	.8125	37,800	260	15	62	86	150	17	-10	-1
2800-2880 25	.21	.25	100	21	15	185	2500	22.1	.8330	13,200	265	13	34	200	-80	10	-10	-1
2880-2960 26	.20	.49	15	17	35	315	5835	21.2	.1460	4085	315	22	38	170	-80	7	-10	-1
27																		
28																		
16-1680 29	.19		58				12,134							48	80			
1680-2960 30	.25		132				8180							117	114			
31																		
										17.6%	3.3%							
										28,860	494							

	Cut % >3.3	Cut % Fe3O4	2 Mo	3 Ag	Ni	4 Co	5 Mn	6 Fe %	7 Cu %	8 Zn	9 Pb	10 Sn	Bi	11 WO4	12 As	In	14 Fe	Tl
600-680 1	.06	.09	45	33	45	305	6520	28.3	1.14	2065	1650				-220			
680-760 2	.09	.08	20	5	35	220	5515	21.8	.1610	690	90				-100			
760-840 3	.19	.17	80	10	110	290	3090	32.6	1.20	995	520				-80			
840-920 4	.40	.40	-15	18	70	455	1785	31.4	.6610	320	470	37	12	120	105	6	-10	-1
920-1000 5	.43	.52	-15	7	130	1255	1785	35.4	.1965	179	70	9	29	39	-80	5	22	-1
1000-1080 6	.25	.31	10	8	105	555	3210	29.7	.2275	215	140				-50			
1080-1160 7	.17	.55	-20	5	60	380	5000	25.5	.4750	50	200	13	3	42	-100	5	-10	-1
1160-1240 8	.11	.24	-15	8	50	450	8440	23.3	.3820	320	690				-80			
9																		
1480-1560 10	.37	.66	10	8	50	120	1350	21.5	.4875	225	140	45	7	50	-50	8	-10	-1
1560-1640 11	.27	.27	-20	15	60	320	2500	33.8	.9500	2450	380	10	14	76	-100	9	-10	-1
1640-1720 12	.30	.73	15	14	170	570	2140	28.6	.8570	500	145	>100	7	13	-80	6	-10	-1
1720-1800 13	.55	2.1	-10	10	410	770	3000	31.4	.6375	50	100	8	7	10	-50	4	-10	-1
1800-1880 14	.80	.84	30	10	120	280	500	35.0	.4625	75	130	7	28	13	-50	5	-10	-1
1880-1960 15	1.4	.52	40	10	70	470	1000	39.4	.6250	200	90	7	23	39	-50	5	-10	-1
1960-2040 16	.82	.25	190	5	60	580	250	32.9	.3125	650	160	8	28	43	-50	4	-10	-1
2040-2120 17	2.6	1.2	280	10	80	1110	315	38.2	1.35	75	130	13	13	60	-50	4	10	-1
2120-2200 18	.86	.25	570	12	60	890	515	33.1	.9875	5325	470	17	9	60	-50	4	-10	-1
2200-2280 19	.74	.19	790	12	150	1810	300	35.6	.5625	175	130	12	32	76	-50	4	22	-1
2280-2360 20	.36	.67	370	11	285	1200	2500	32.7	1.09	215	85	5	30	15	-80	4	14	-1
2360-2440 21	.46	.72	1130	11	185	1270	1785	28.9	3.55	70	100	14	9	33	-80	10	-10	-1
2440-2520 22	.38	.34	2560	18	170	1115	735	30.9	7.18	70	100	15	10	39	-80	6	-10	-1
2520-2600 23	.28	.38	1340	10	120	1180	1160	27.0	5.15	50	80	13	9	39	-100	4	-10	-1
2600-2680 24	.38	.22	1380	20	80	920	2250	27.0	4.98	25	40	22	8	60	-50	4	-10	-1
2680-2760 25	.90	.28	600	10	60	1020	1000	33.0	2.65	475	70	16	8	96	-50	10	-10	-1
2760-2840 26	.79	.41	790	12	80	930	335	33.1	3.19	275	180	12	19	62	-50	4	-10	-1
2840-2920 27	.39	.52	600	11	70	960	210	32.5	3.71	855	355	7	30	25	70	4	-10	-
2920-3000 28	.73	.30	310	12	60	840	162	34.8	3.20	2000	200	7	>100	13	-50	5	-10	-1
3000-3104 29	.17	.39	120	10	70	580	1250	35.5	.4125	6025	160	8	7	11	50	7	-10	-1
30																		
31																		

AMPAD EFFICIENCY LINE NO. 6636

HOLE J-5 AA -ppm } unless otherwise noted

	wt % >3.3	wt % Fe_3O_4	2 Mo	3 Ag	Ni	4 Co	5 Mn	6 Fe %	7 Cu %	8 Zn	9 Pb	10 Sn spectro	Bi spectro	11 WO4 spectro	12 As color	In spectro	Te spectro	Tl spectro
1440-1480 1	.27	.27	110	12	30	180	4500	22.8	1.15	11,000	240	52	83	> 200	-50	8	-10	-1
1480-1560 2	.20	.60	515	11	45	230	7140	21.1	.82	5,500	630	>100	15	> 200	-80	7	-10	-1
1560-1640 3	.32	.61	455	7	15	185	5715	20.4	.98	180	185	71	7	160	-80	10	-10	-1
1640-1720 4	.26	1.4	570	18	100	770	1070	27.9	3.93	355	215	18	11	150	-80	6	-10	-1
1720-1800 5	.37	1.2	390	15	70	620	1750	29.4	1.94	1275	120	25	15	86	-50	7	-10	-1
1800-1880 6	.36	2.7	370	11	25	940	6070	26.4	4.04	145	55	21	4	50	-80	7	-10	-1
1880-1960 7	.41	2.8	415	18	315	1185	5000	28.9	6.12	355	30	20	11	160	-80	7	-10	-1
1960-2040 8	.54	2.0	620	20	240	1490	3000	29.8	6.55	2850	50	20	7	39	-50	6	-10	-1
2040-2120 9	.67	3.8	390	15	360	1130	7500	27.0	6.20	100	80	16	4	23	-50	7	-10	-1
2120-2200 10	.33	1.4	2060	19	110	890	825	32.7	5.69	80	30	10	10	15	-80	5	-10	-1
2200-2280 11	.11	.74	2250	12	70	855	1220	31.1	4.26	355	45	7	38	20	-100	5	-10	-1
2280-2360 12	.20	.80	4800	28	150	835	1060	28.9	5.41	155	100	18	>100	90	-70	6	13	-1
2360-2440 13	.45	1.5	1955	25	370	1070	246	36.2	5.04	465	70				-80			
2440-2520 14	.20	.79	1615	42	185	465	1595	29.6	5.33	415	250				-80			
15																		
2600-2680 16	.09	.49	3550	40	80	460	495	24.5	12.0	1400	140				-100			
2680-2760 17	.06	.39	4810	32	45	425	535	19.2	11.5	2940	150				-100			
2760-2825 18	.04	.33	2820	24	65	445	411	16.6	6.9	235	125				-160			
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		
31																		
										1636	148							

AMPAD EFFICIENCY LINE NO. 6636

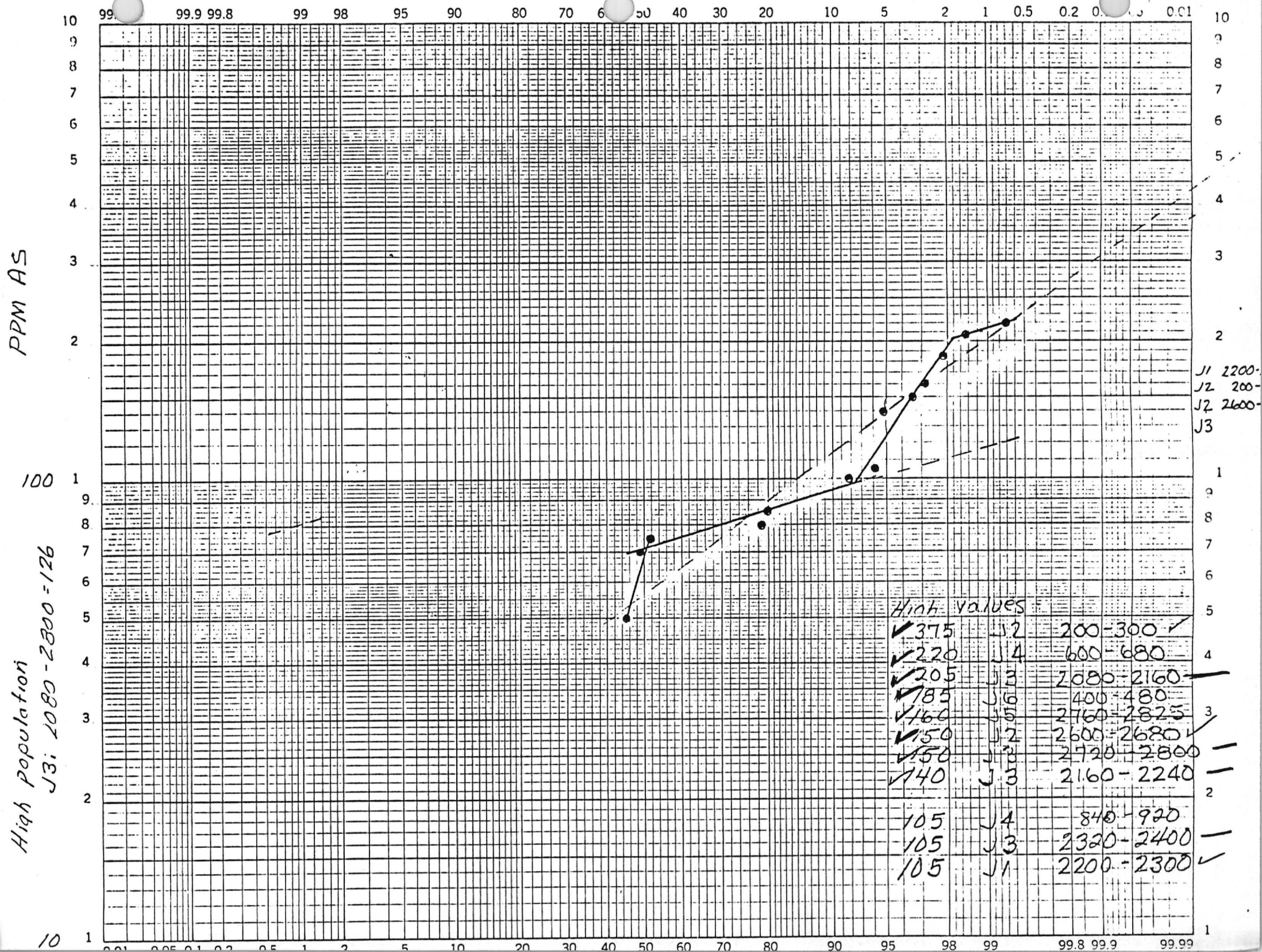
06

	Wt % >3.3	Wt % Fe_3O_4	2 Mo	3 Ag	Ni	4 Co	5 Mn	6 Fe %	7 Cu %	8 Zn	9 Pb	10 Sn	Bi	11 WO4	12 As	In	13 Te	Tl
0-80 1	.60	.70	10	-3	60	430	10,100	34.0	.0110	2300	170	27	4	80	-50	11	-10	-1
2																		
320-400 3	.33	.15	-20	-5	50	30	4040	32.2	.0071	2460	260	56	10	60	-85	10		
400-480 4	.12	.25	-40	-10	110	-40	17,800	27.4	.0629	4120	150	78	5	110	-185	8		
480-560 5	.37	.43	10	-3	50	50	16,200	26.2	.0200	1850	160	60	4	> 200	-50	27		
560-640 6	.74	.84	10	-3	40	70	24,000	25.0	.0190	2300	110	35	5	> 200	-50	45		
640-720 7	.70	.78	20	-3	40	70	27,200	19.8	.0525	3800	120	25	5	> 200	-50	6		
720-800 8	.82	.90	10	-3	50	100	22,500	22.8	.0355	1950	80	27	5	150	-50	10		
800-880 9	1.30	.83	20	-3	60	210	15,800	26.5	.0145	1200	100	33	10	72	-50	8		
880-960 10	1.33	.83	-10	-3	50	70	10,600	21.0	.0102	1220	100	27	5	72	-50	12		
960-1040 11	.69	.96	40	-3	70	90	1920	24.0	.0488	300	170	14	5	160	-50	8		
1040-1120 12	.56	.71	-10	-3	60	90	11,800	13.2	.1015	200	110	28	4	60	-50	11		
1120-1200 13	1.36	.97	-10	-3	40	50	4100	30.2	.0190	600	80	17	21	60	-50	16		
1200-1280 14	.46	.63	10	-3	50	140	5300	21.5	.1180	19,800	280	21	18	120	-50	16		
1280-1360 15	1.03	.80	-10	-3	50	210	1880	27.2	.1900	35,500	120	10	56	76	-50	21		
1360-1440 16	.22	.62	10	-3	50	210	4000	17.8	.0710	11,500	260	34	5	170	-50	16		
17																		
1520-1600 18	.34	.72	10	-3	60	160	18,200	15.8	.1540	15,500	160	46	15	86	-50	14		
1600-1680 19	.98	1.31	20	12	70	470	2580	30.2	.6280	19,000	220	13	20	140	50	12		
1680-1760 20	.74	1.94	-10	-3	60	260	2850	22.0	.4650	9000	290	19	68	>200	-50	15		
21																		
1880-1960 22	.45	.70	-10	-3	50	40	14,000	8.88	.0570	475	360	35	16	86	-50	10		
23																		
2320-2400 24	.89	.80	-10	-3	30	60	11,900	7.38	.0365	700	120	31	5	38	-50	12		
2400-2480 25	.93	.79	90	-3	60	110	13,000	11.60	.0748	212	120	38	11	32	-50	10		
2480-2590 26	.47	.79	20	-3	8	80	7750	8.25	.0652	550	120	25	9	28	-50	9		
27																		
28																		
0-1760 29			15.6		57	153		24.27		7367				123		15		
1760-2590 30			32.5		37	72		9.03		484				46		10		
31																		

K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

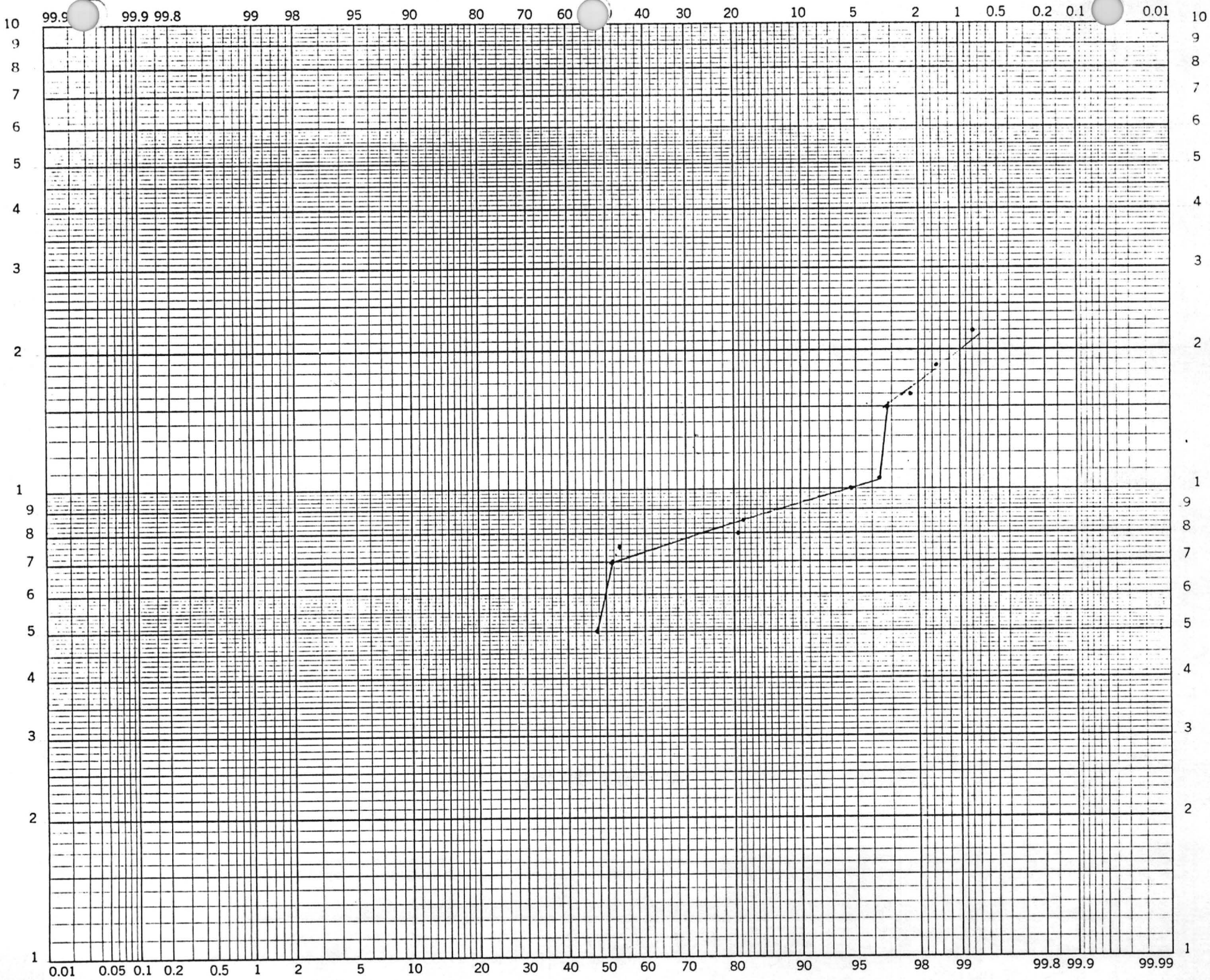
As



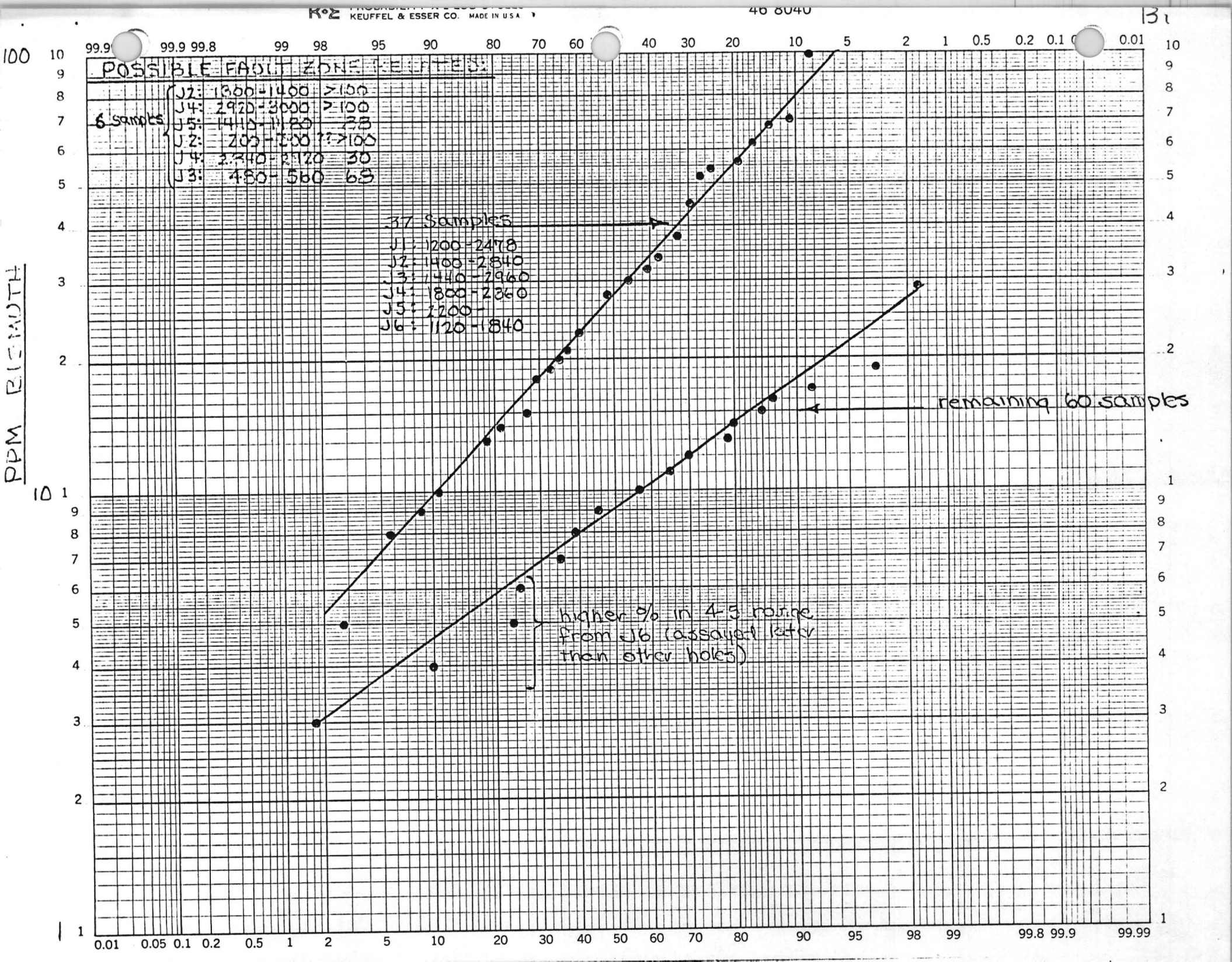
K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

As

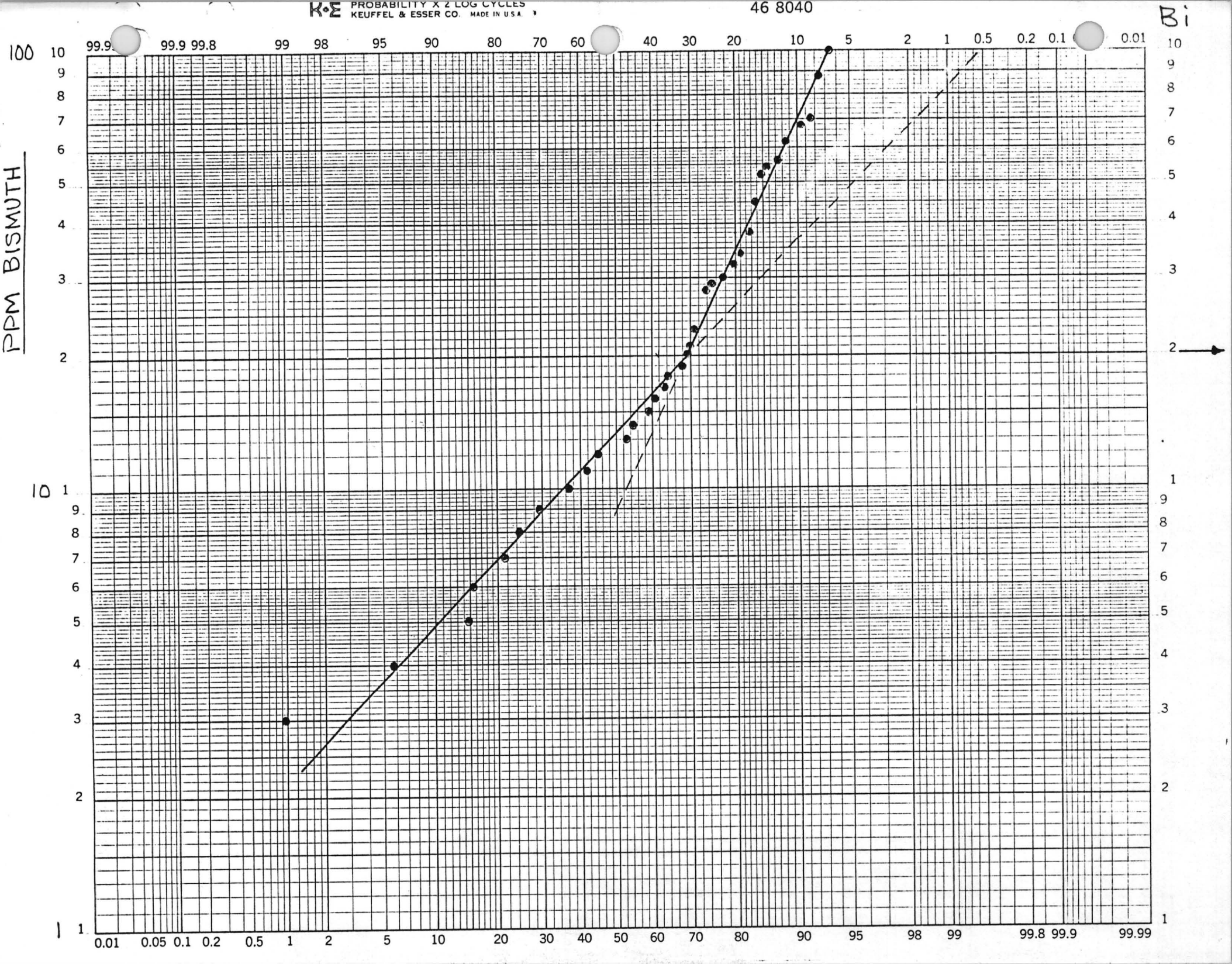


K+E PROBABILITY 46 8040
KEUFFEL & ESSER CO. MADE IN U.S.A.

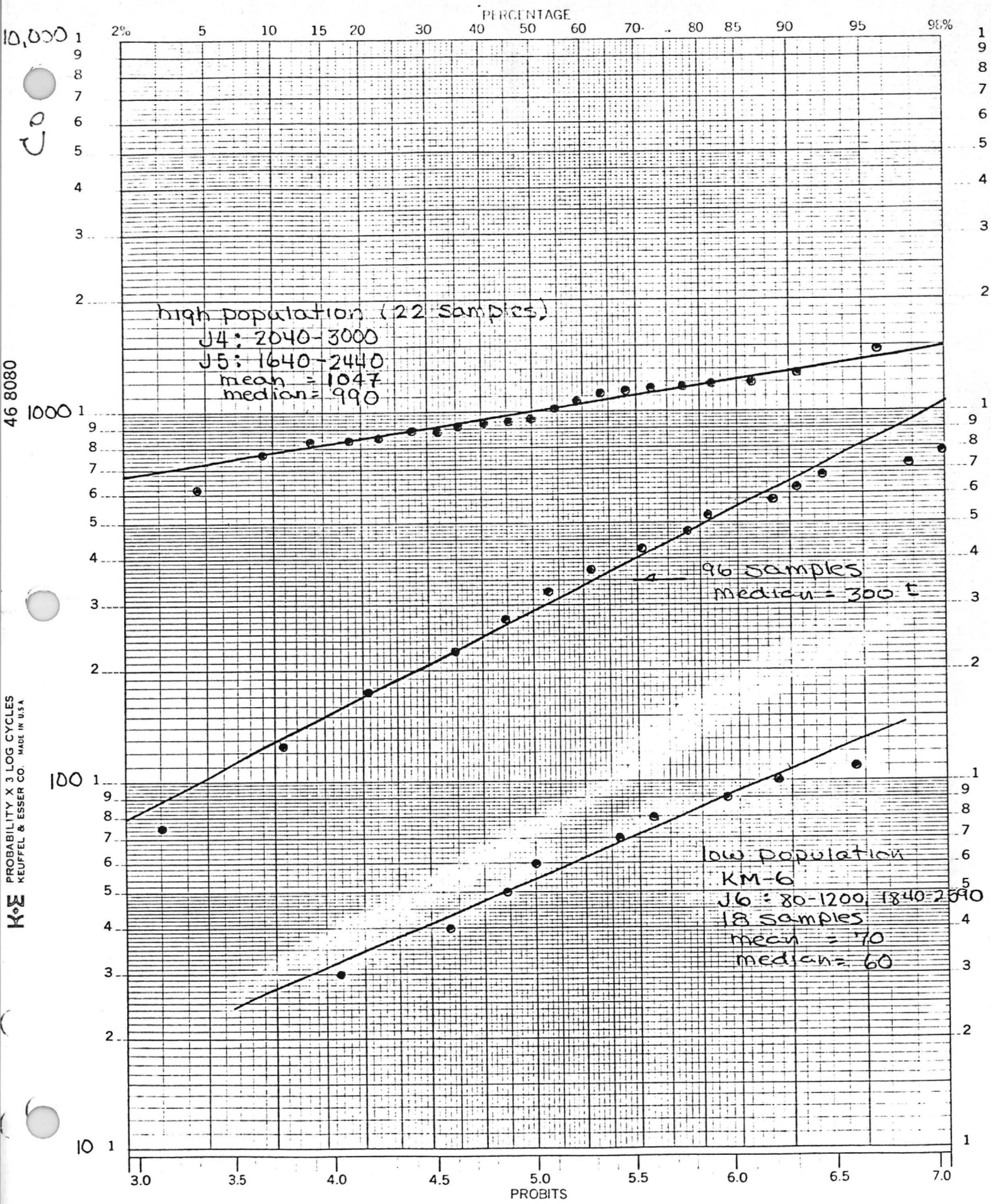


K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

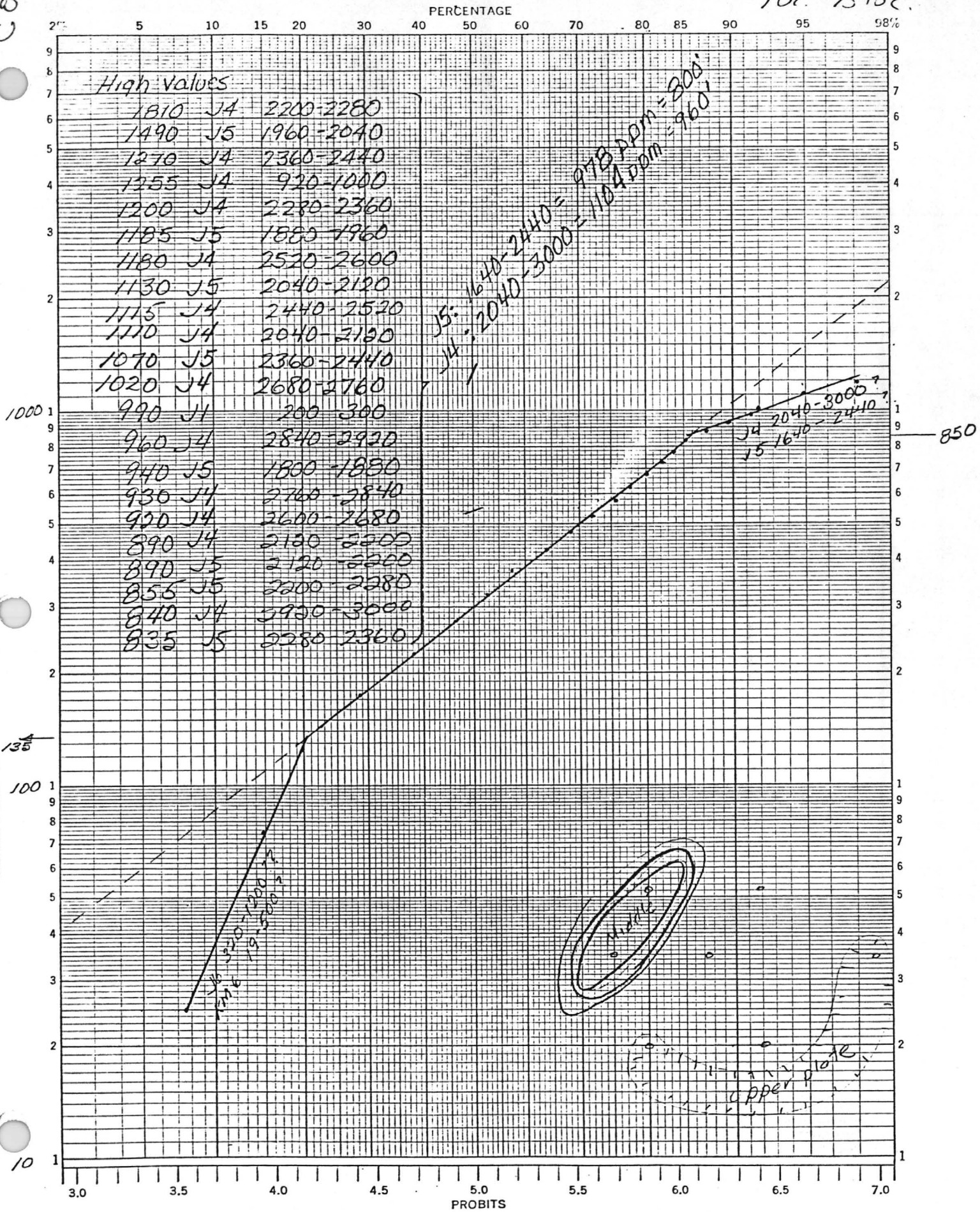


COBALT



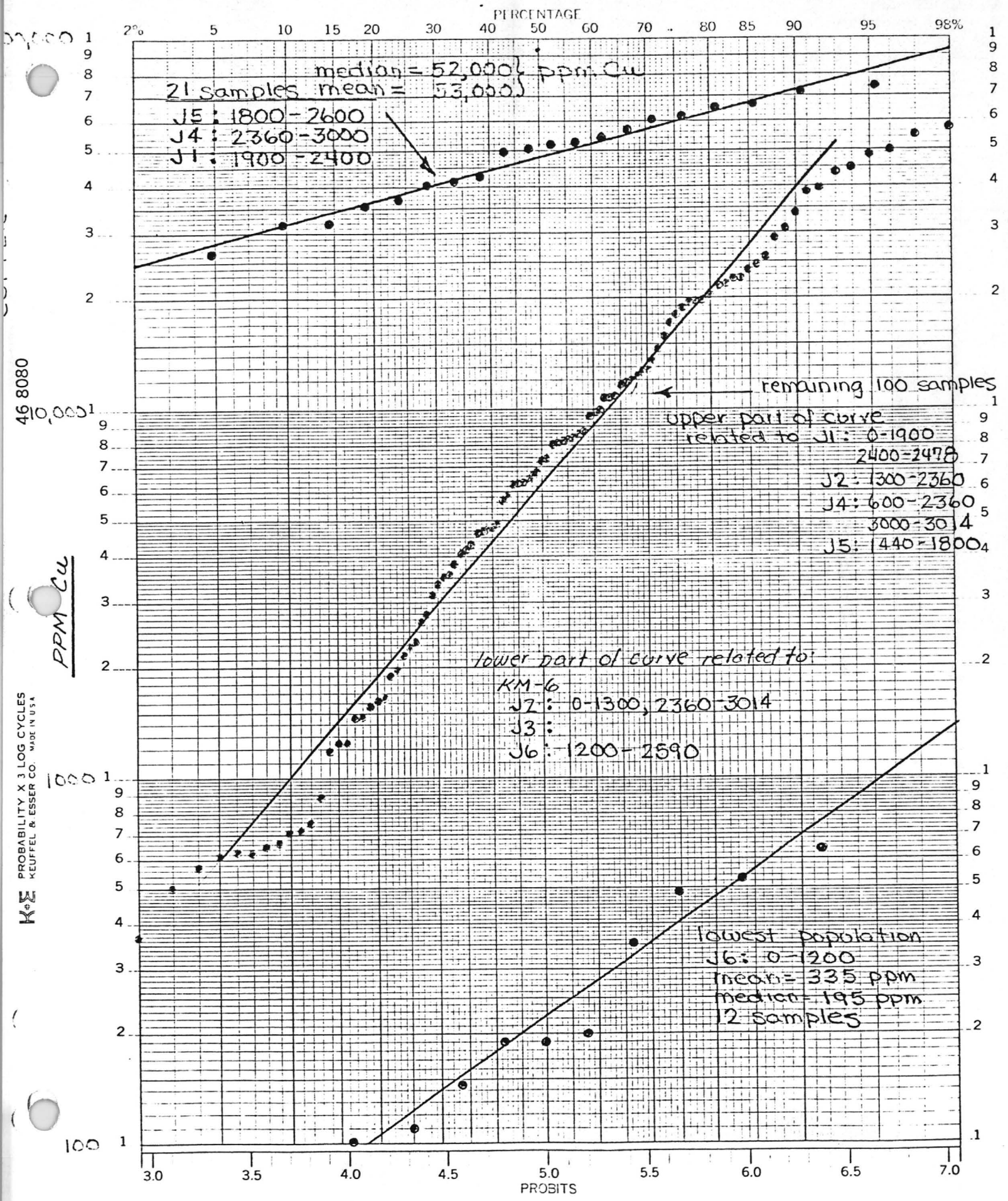
46 8080
K+E PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Pick up Box
(100 sheets)
Tuc. Blue.



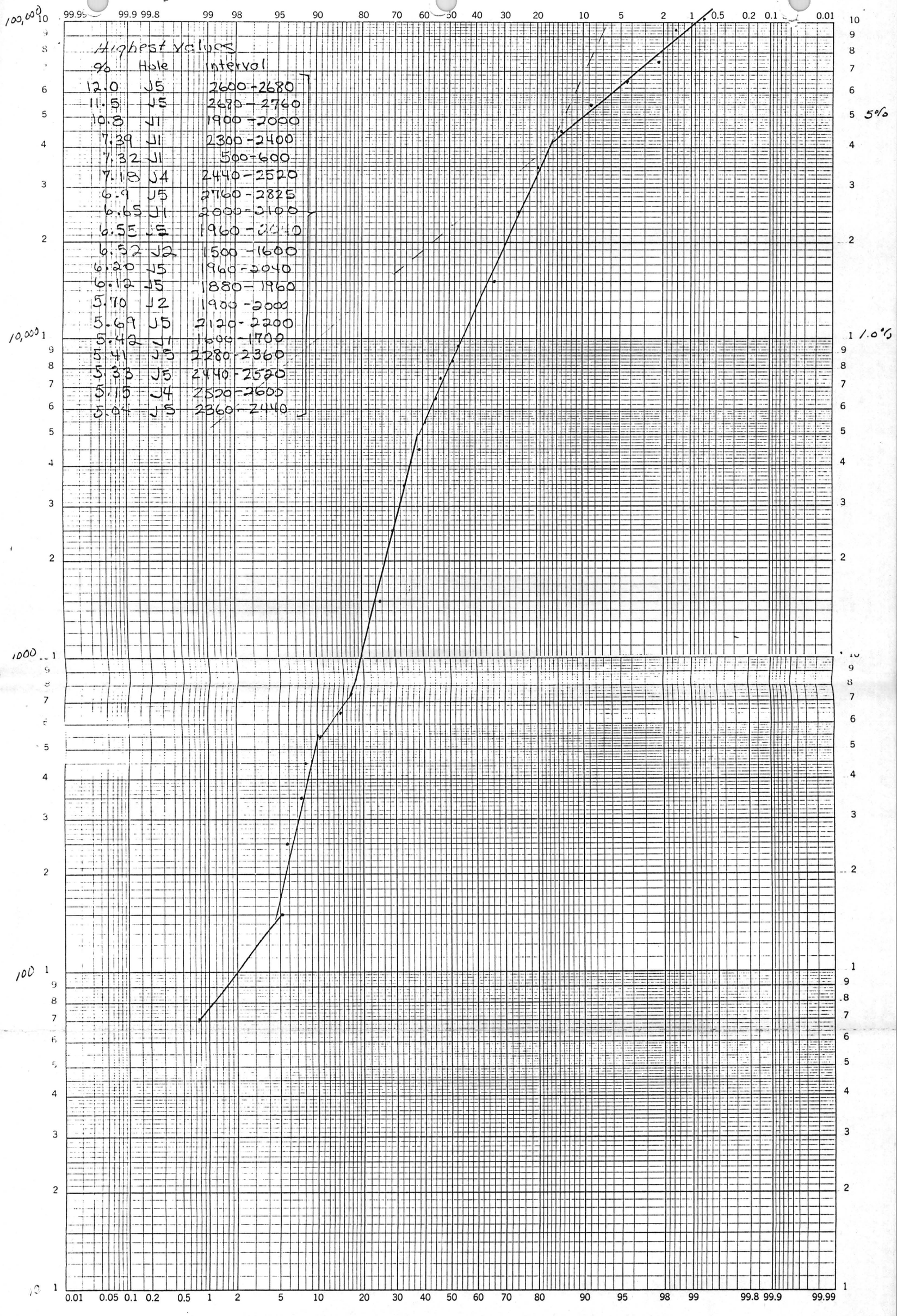
K&E X 3 LOG CYCLES MADE IN U.S.A.
KEUFFEL & ESSER CO.

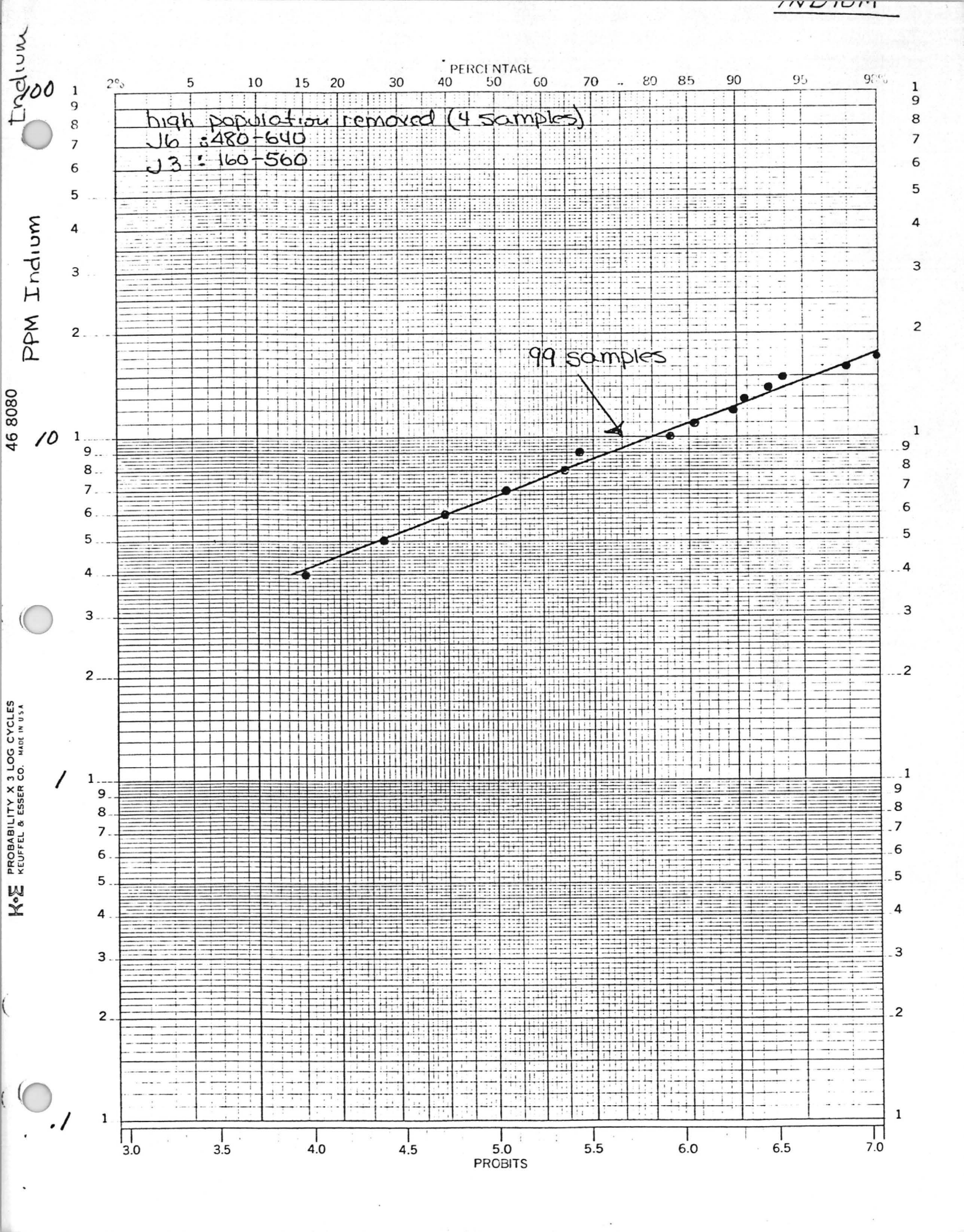
highest population (not plotted)
J5: 2600-2825 (mean = 94,700 ppm)
(3 samples)



K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

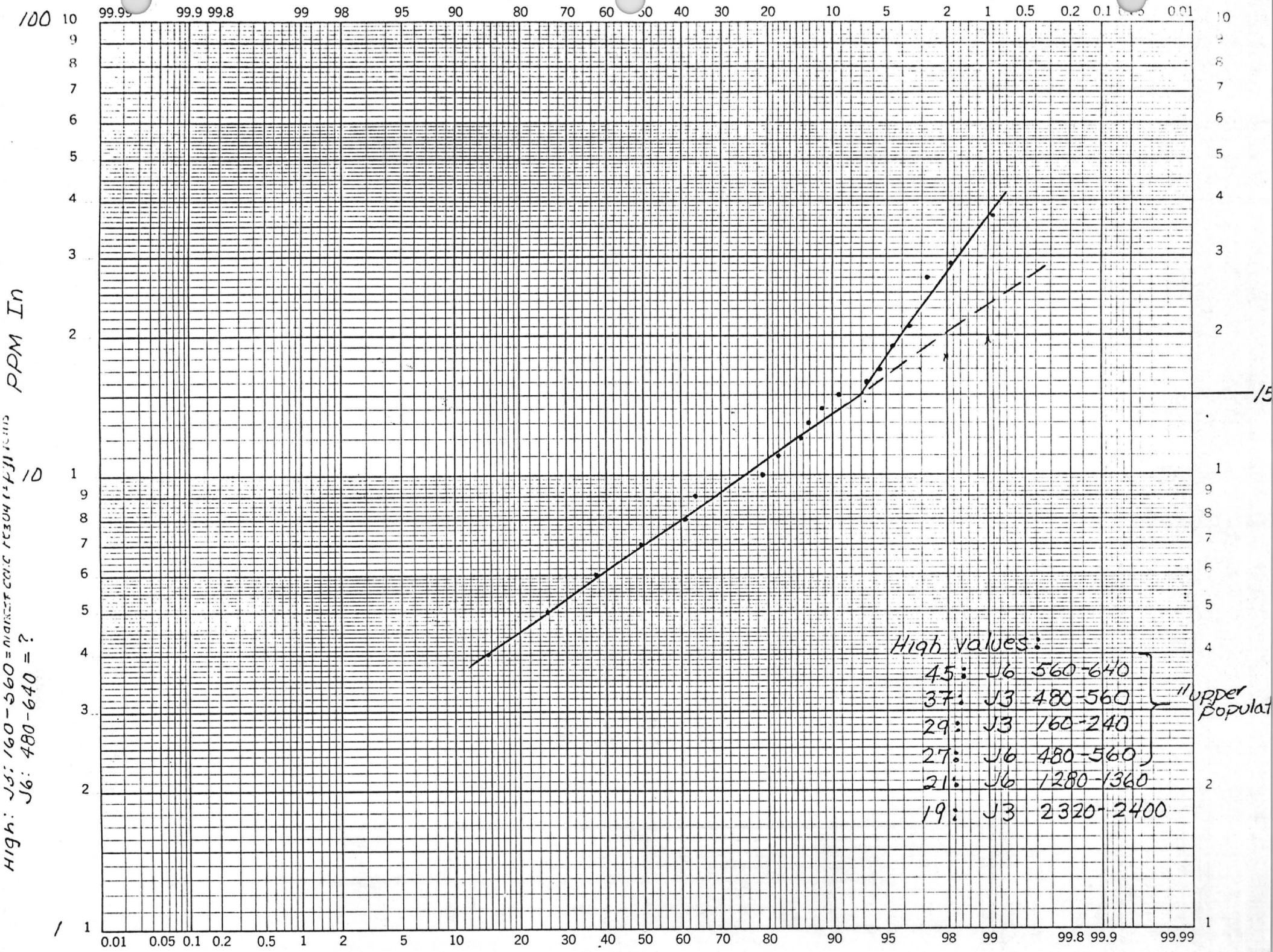



Indium
PERCENTAGE
2% 5 10 15 20 30 40 50 60 70 80 85 90 95 98%
high population removed (4 samples)
J6 : 480-640
J3 : 160-560
99 samples
PPM Indium
100
10
1
.1
PROBITS
3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
46 8080
K+E PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

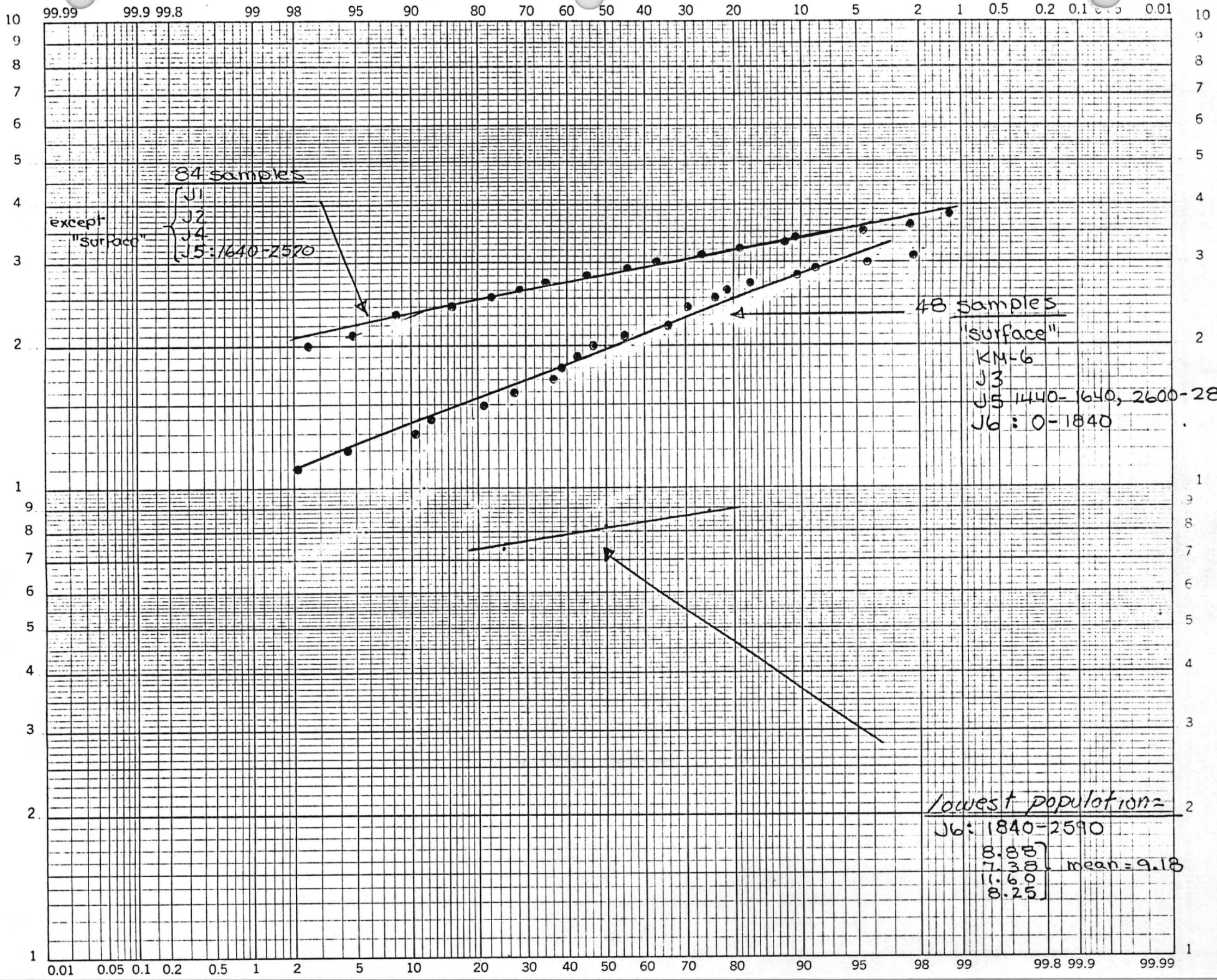
Indium



K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

J1, J2, J4, J5: 1640 - 2520

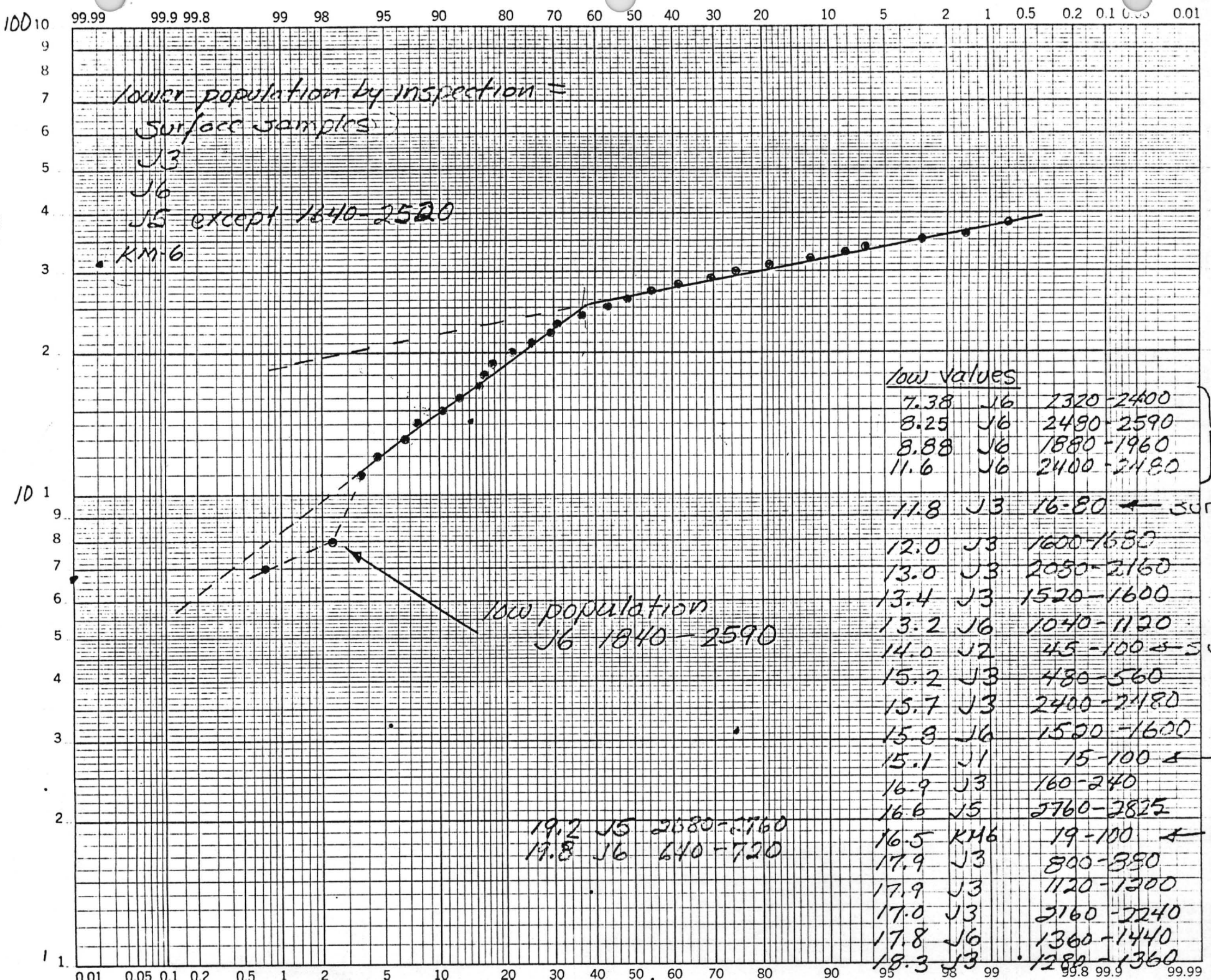
Fe



K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

Fe



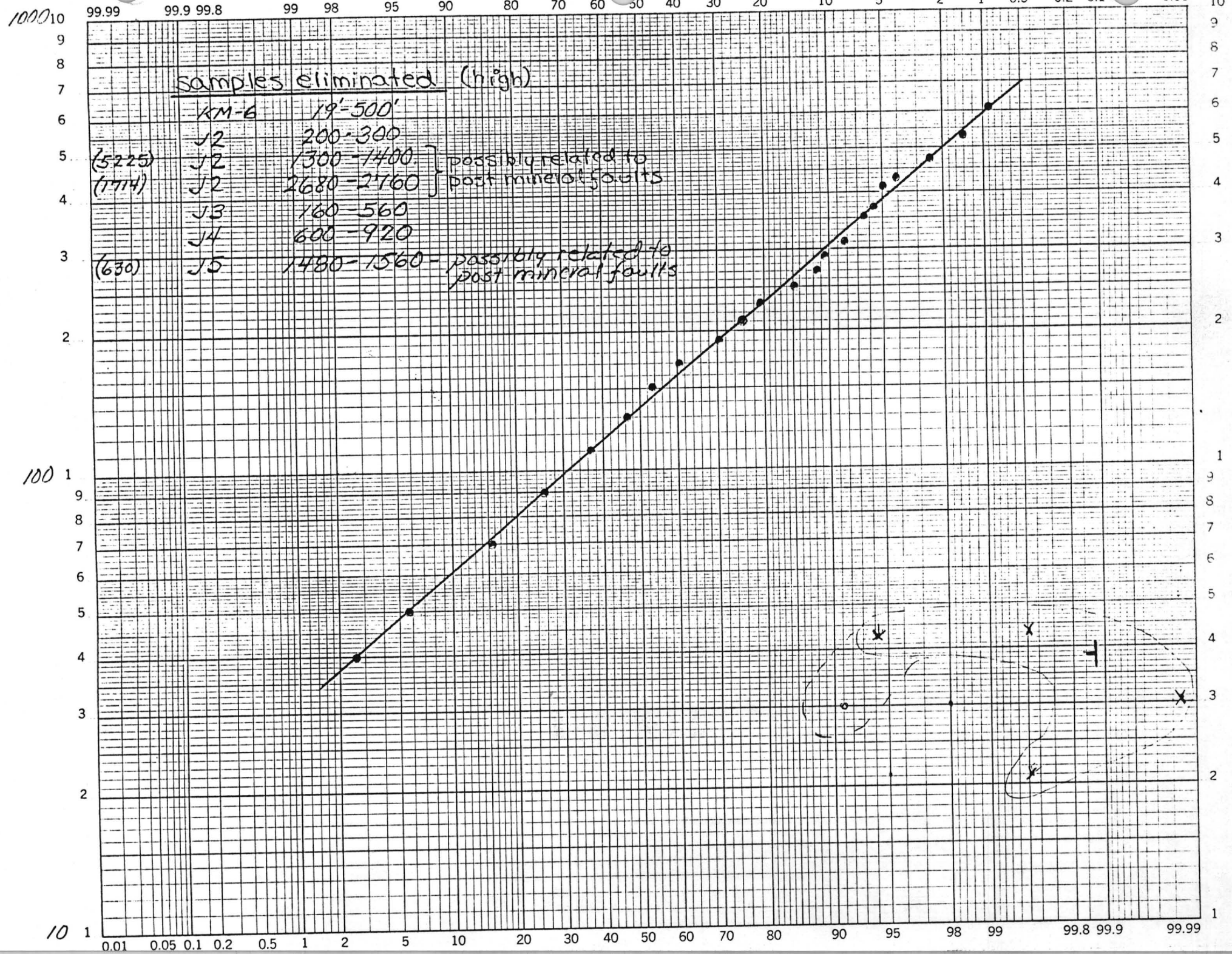
low values

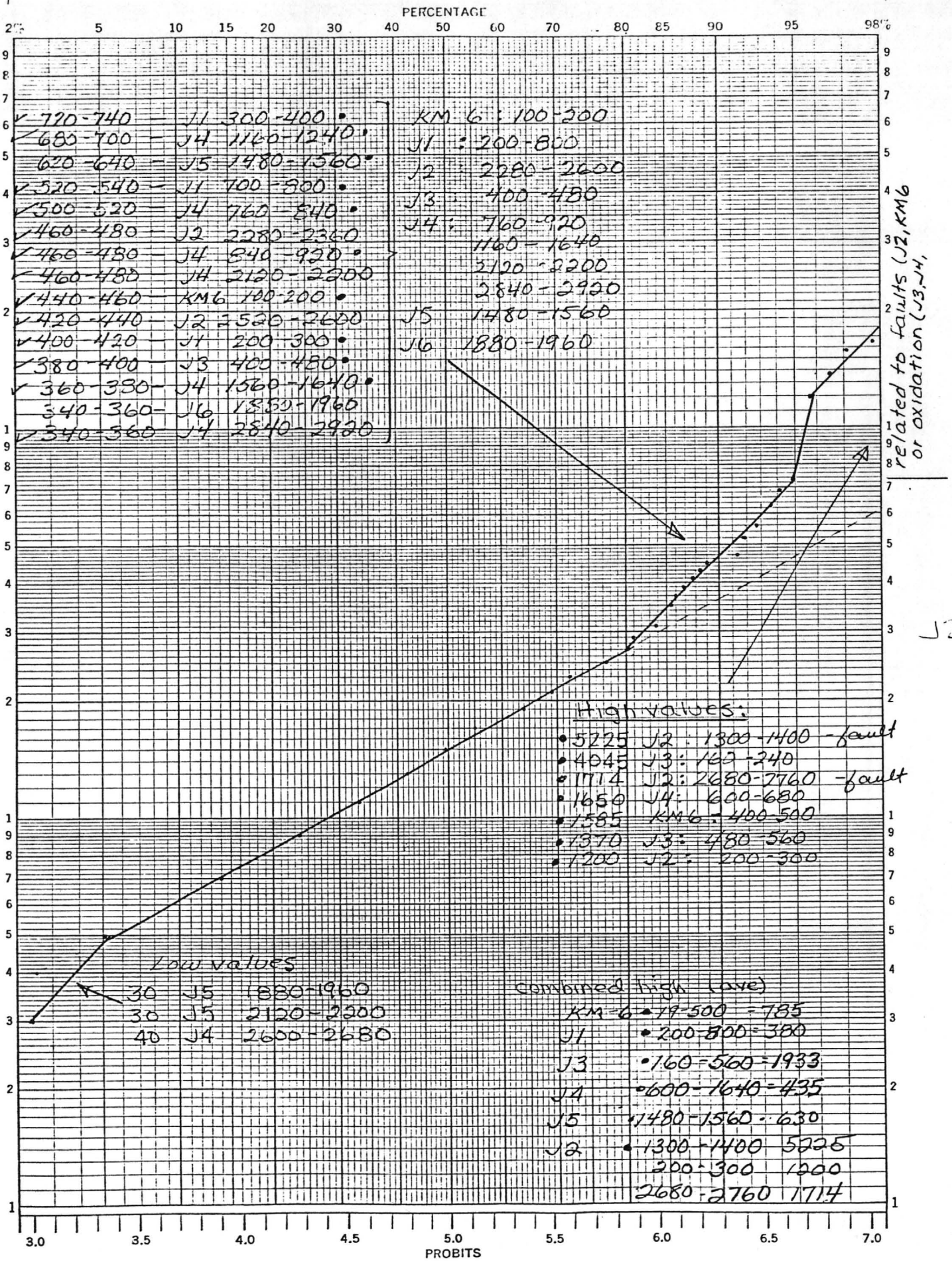
7.38	J6	2320-2400
8.25	J6	2480-2590
8.88	J6	1880-1960
11.6	J6	2400-2480
11.8	J3	16-80 ← surface
12.0	J3	1600-1680
13.0	J3	2080-2160
13.4	J3	1520-1600
13.2	J6	1040-1120
14.0	J2	45-100 ← surface
15.2	J3	480-560
15.7	J3	2400-2480
15.8	J6	1520-1600
15.1	J1	15-100 ← surfa
16.9	J3	160-240
16.6	J5	2760-2825
16.5	KM6	19-100 ← surfac
17.9	J3	800-880
17.9	J3	1120-1200
17.0	J3	2160-2240
17.8	J6	1360-1440
18.3	J3	1280-1360

"lowest pop."

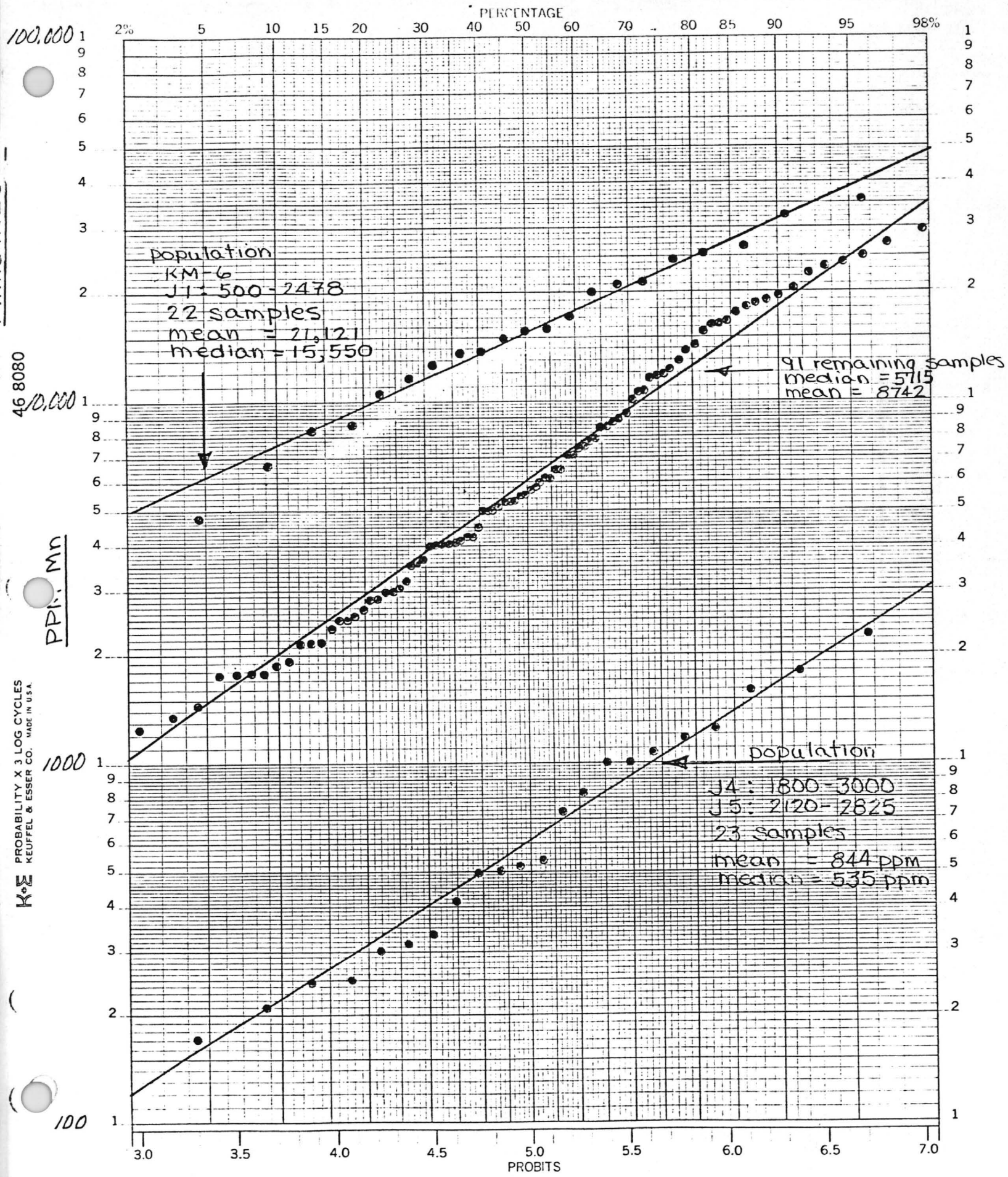
K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040 P5




PERCENTAGE
2% 5 10 15 20 30 40 50 60 70 80 85 90 95 98%
PROBITS
3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
10 100 1000
720-740 — J1 300-400 •
685-700 — J4 1160-1240 •
620-640 — J5 1480-1560 •
520-540 — J1 700-800 •
500-520 — J4 760-840 •
460-480 — J2 2280-2360
460-480 — J4 840-920 •
460-480 — J4 2120-2200
440-460 — KM6 100-200 •
420-440 — J2 2520-2600
400-420 — J1 200-300 •
380-400 — J3 400-480 •
360-380 — J4 1560-1640 •
340-360 — J6 1880-1960
340-360 — J4 2840-2920
KM 6 : 100-200
J1 : 200-800
J2 : 2280-2600
J3 : 400-480
J4 : 760-920
1160-1640
2120-2200
2840-2920
J5 1480-1560
J6 1880-1960
related to faults (J2, KM6 or oxidation (J3, J4,
High values:
• 5225 J2 : 1300-1400 - fault
• 4045 J3 : 160-240
• 1714 J2 : 2680-2760 - fault
• 1650 J4 : 600-680
• 1585 KM6 : 400-500
• 1370 J3 : 480-560
• 1200 J2 : 200-300
Low values
30 J5 1880-1960
30 J5 2120-2200
40 J4 2600-2680
Combined high (ave)
KM-6 • 19-500 = 785
J1 • 200-800 = 380
J3 • 160-560 = 1933
J4 • 600-1640 = 435
J5 • 1480-1560 = 630
J2 • 1300-1400 5225
200-300 1200
2680-2760 1714
J2
K+E PROBABILITY X 3 LOG CYCLES 46 8080 MADE IN U.S.A.
KEUFFEL & ESSER CO.

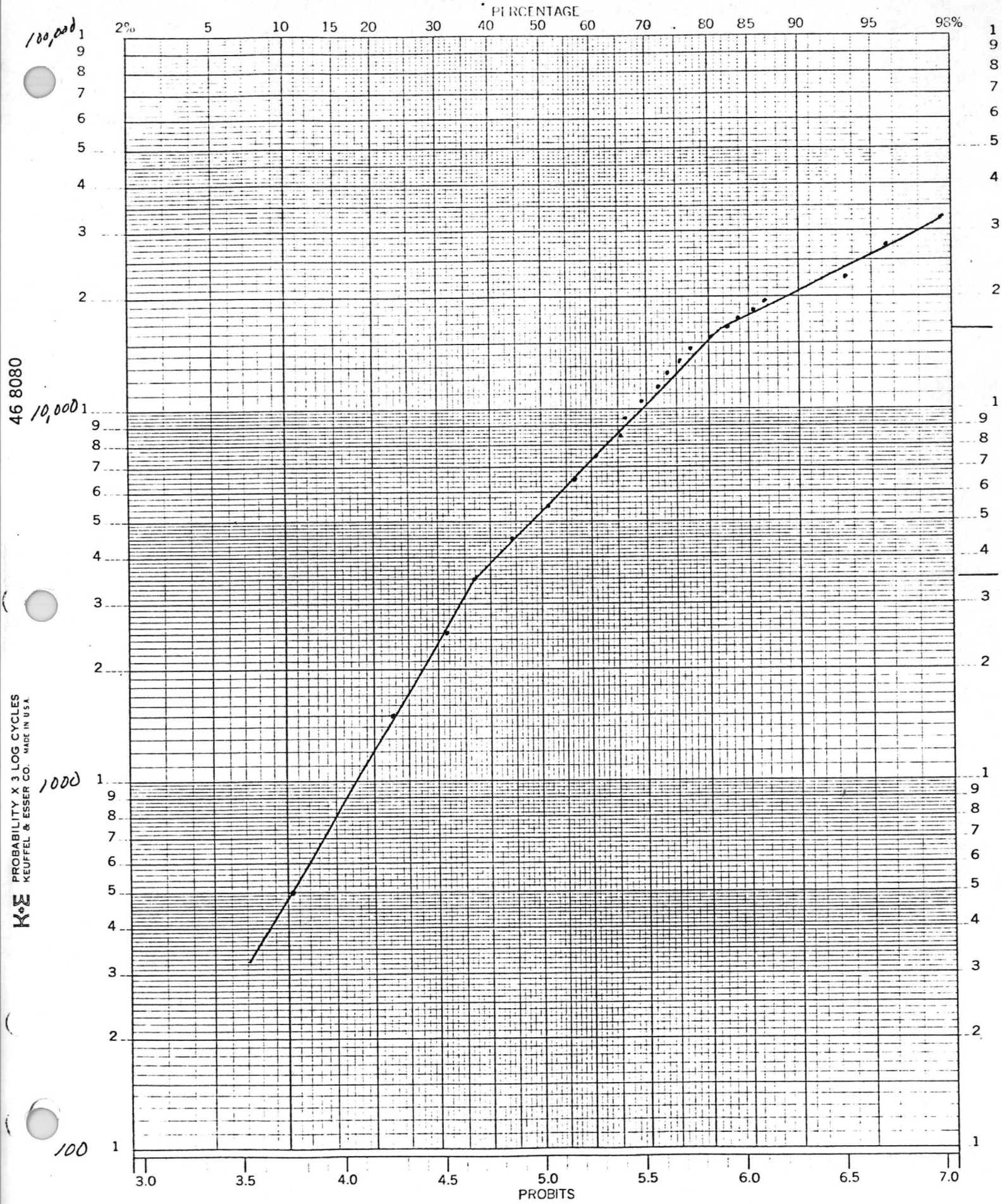
MANGANESE



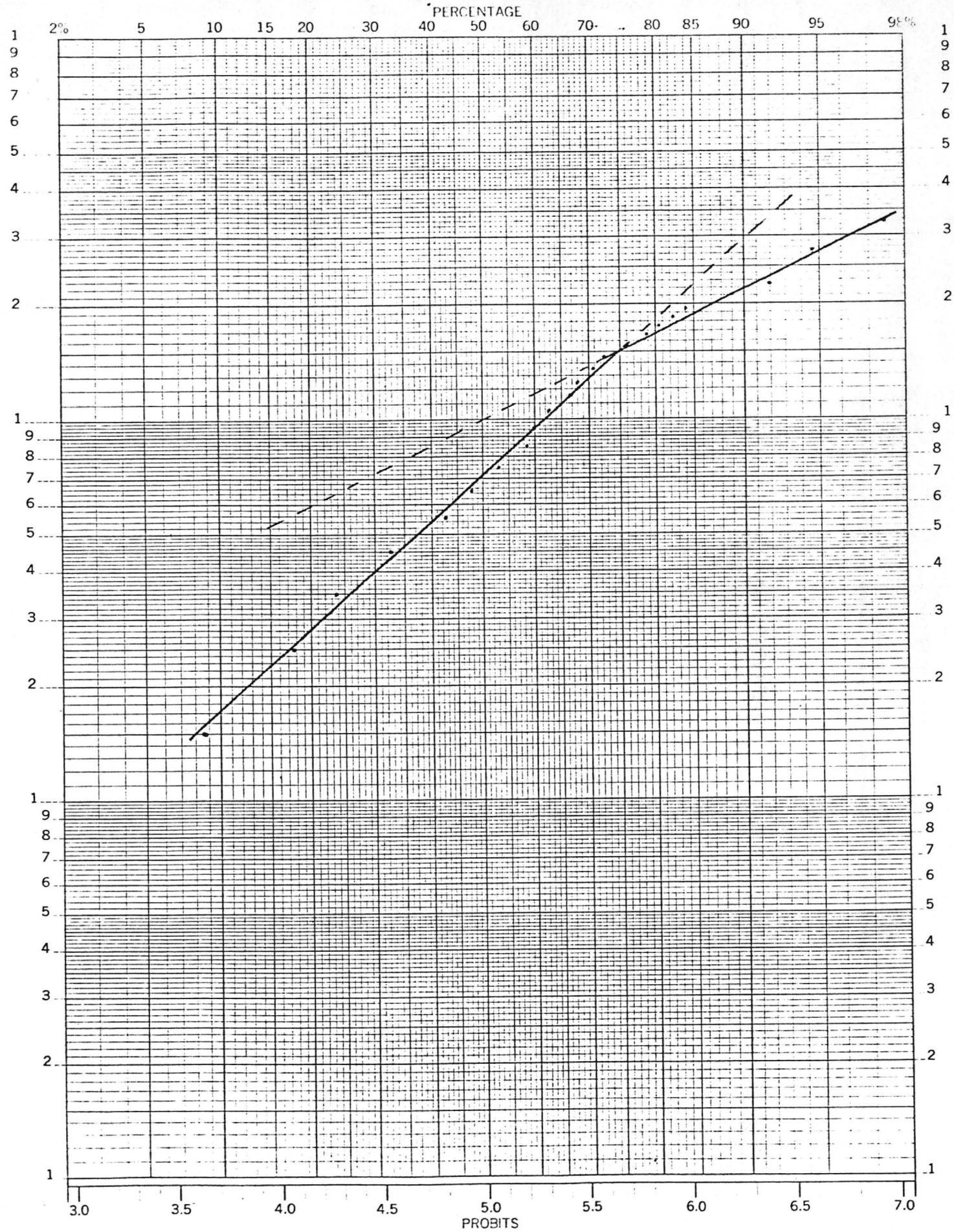
46 8080
K+E PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

MR

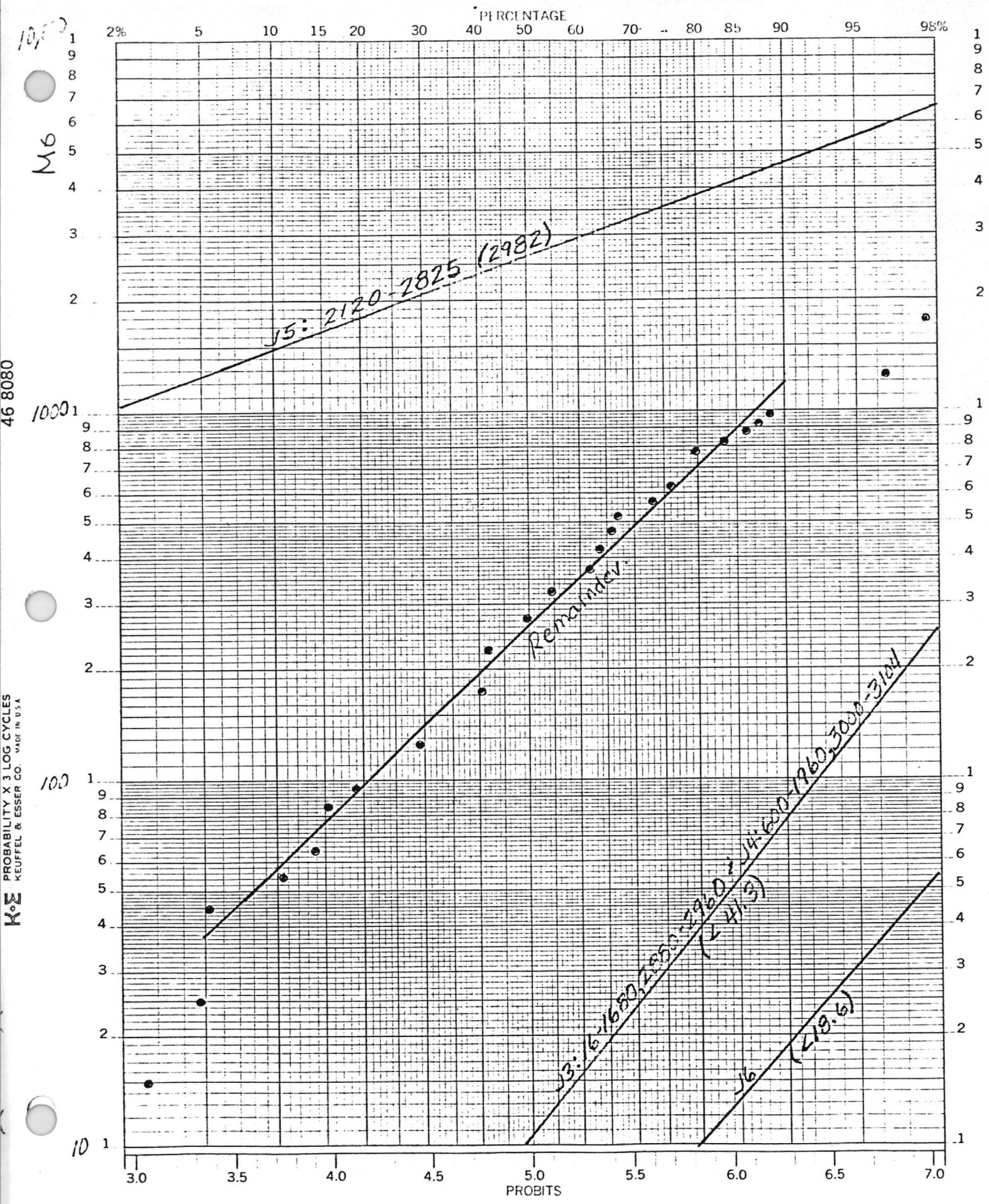
136 Samples



113 samples (lower pop removed)

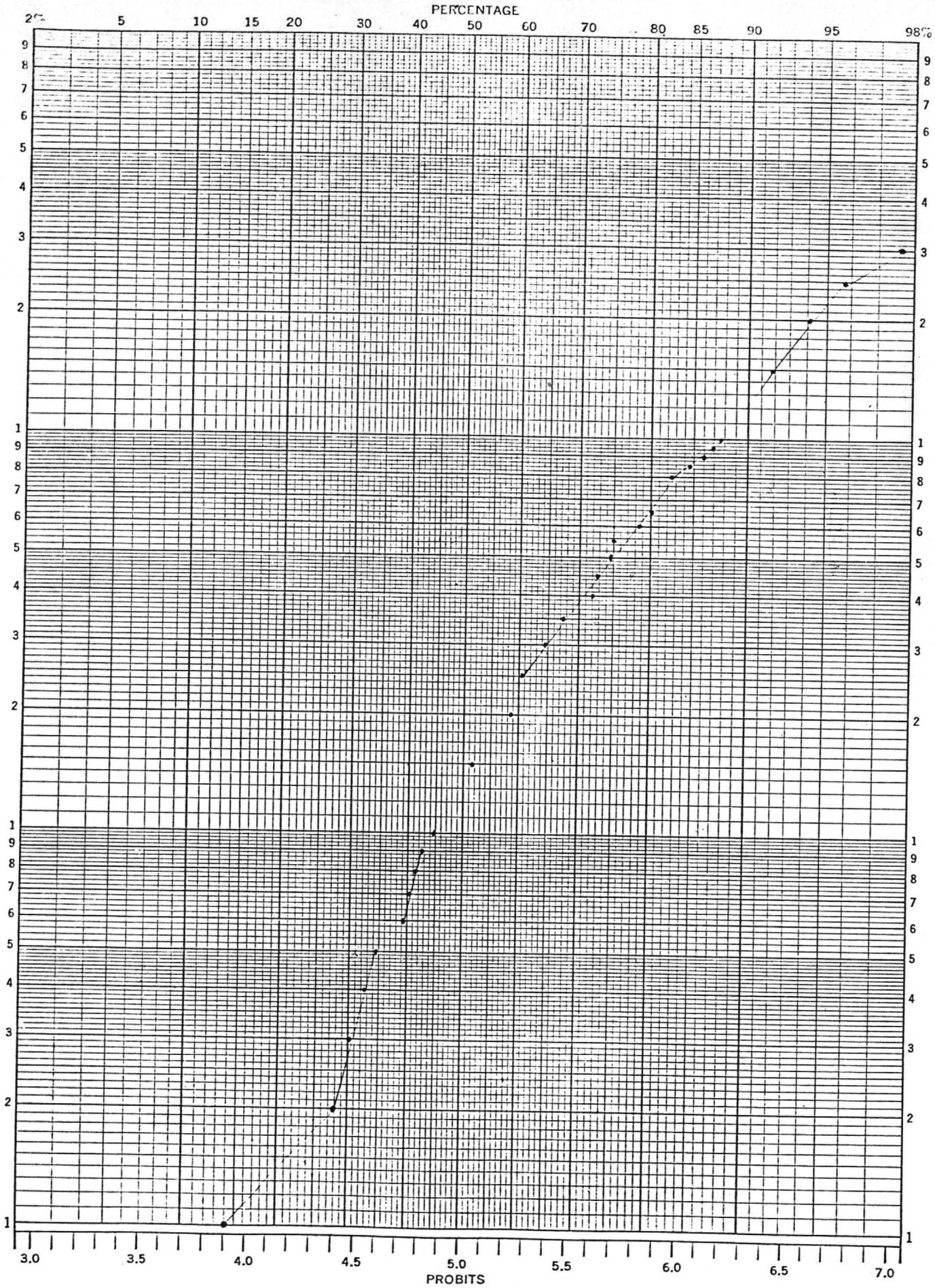


46 8080
K+E PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN USA


PERCENTAGE
2%
5
10
15
20
30
40
50
60
70
80
85
90
95
98%
PROBITS
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
10,000
1000
100
10
M6
J5: 2120-2825 (2982)
Remainder
J3: 16-1680-2950-2960-J4-600-1960-3000-3101
(241.3)
J6
(219.5)
PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 8080

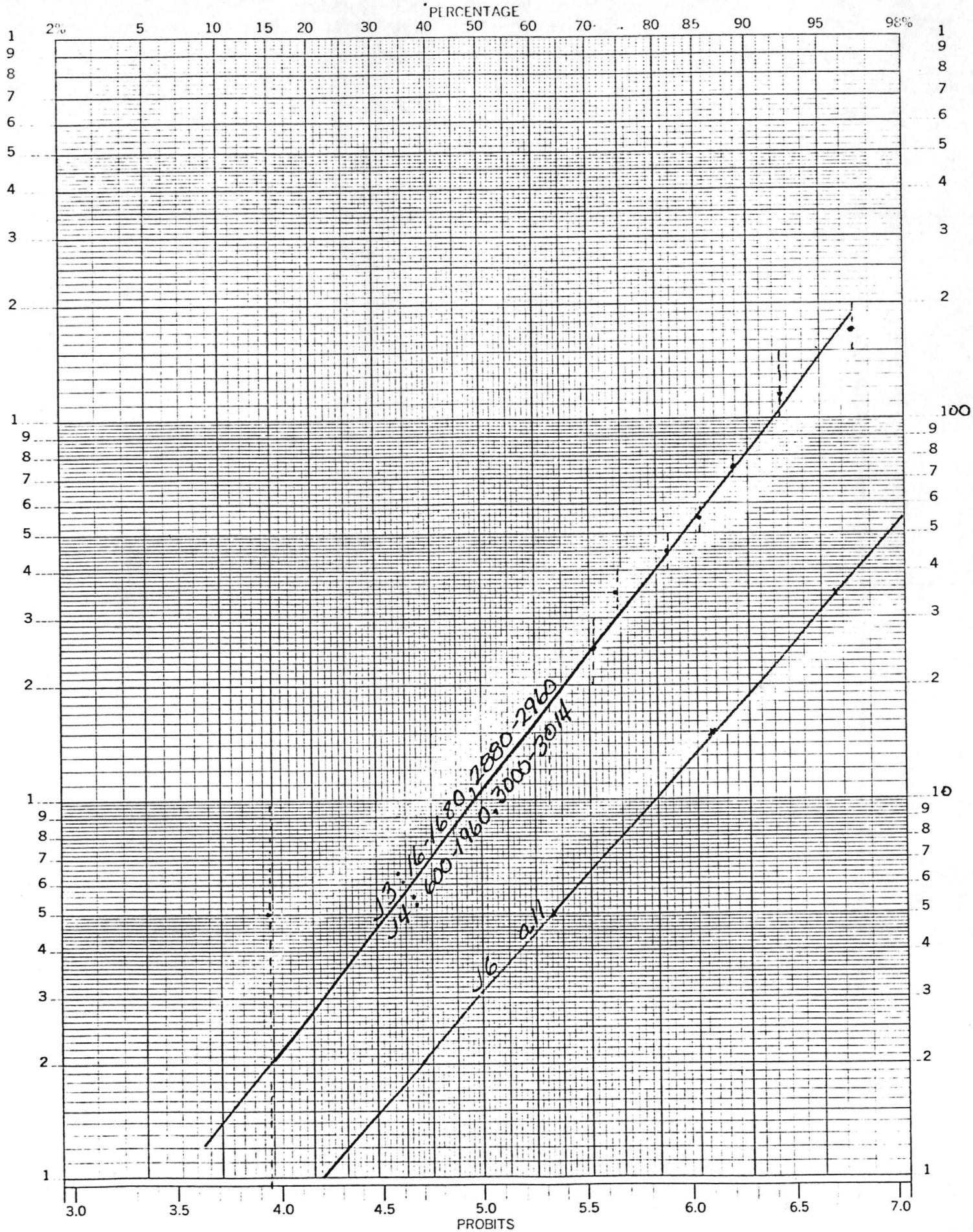
Mo
136

Mo



MADE IN U.S.A.
KEUFFEL & ESSER CO.

Mo S2



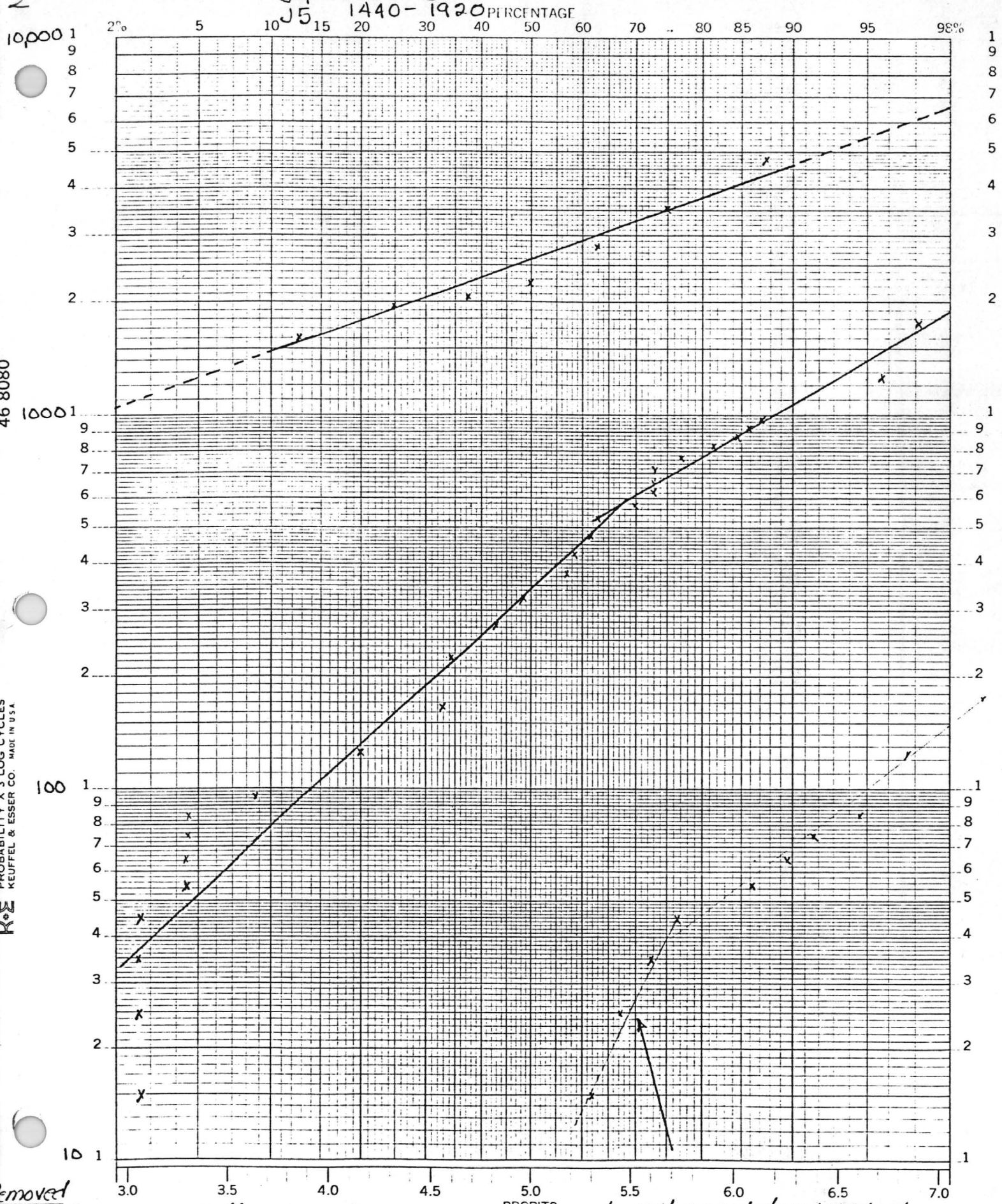
46 8080

K+E PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

MoS2

Mo

J2 1400 - 2680
J3 1680 - 2960
J4 1960 - 3104
J5 1440 - 1920



Removed

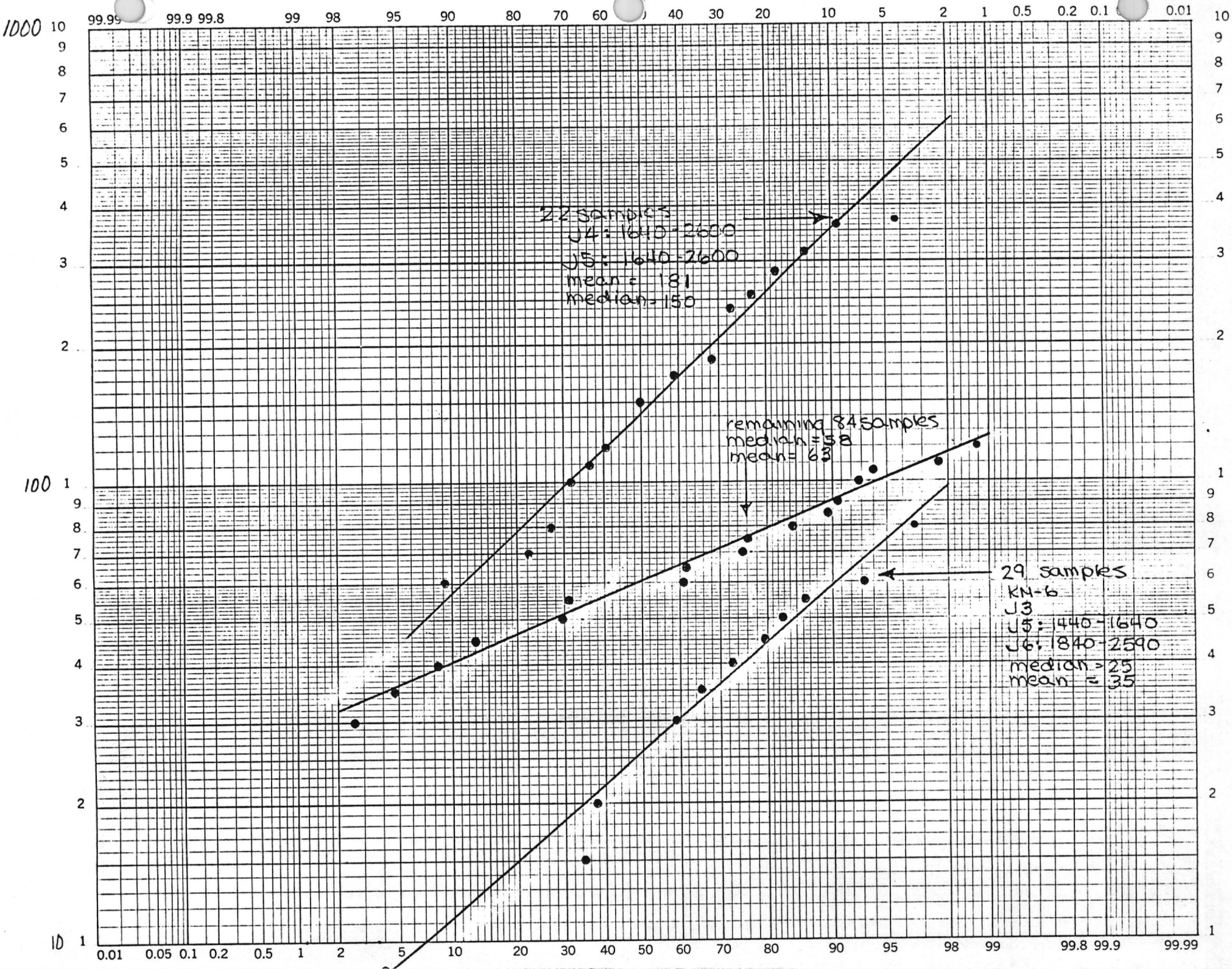
Highest population (2982) = J5: 2120-2825

lowest population: KM 6, J6
J2: 45-1400, 2680-3014
J3: 16-1680
J4: 600-1960

K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

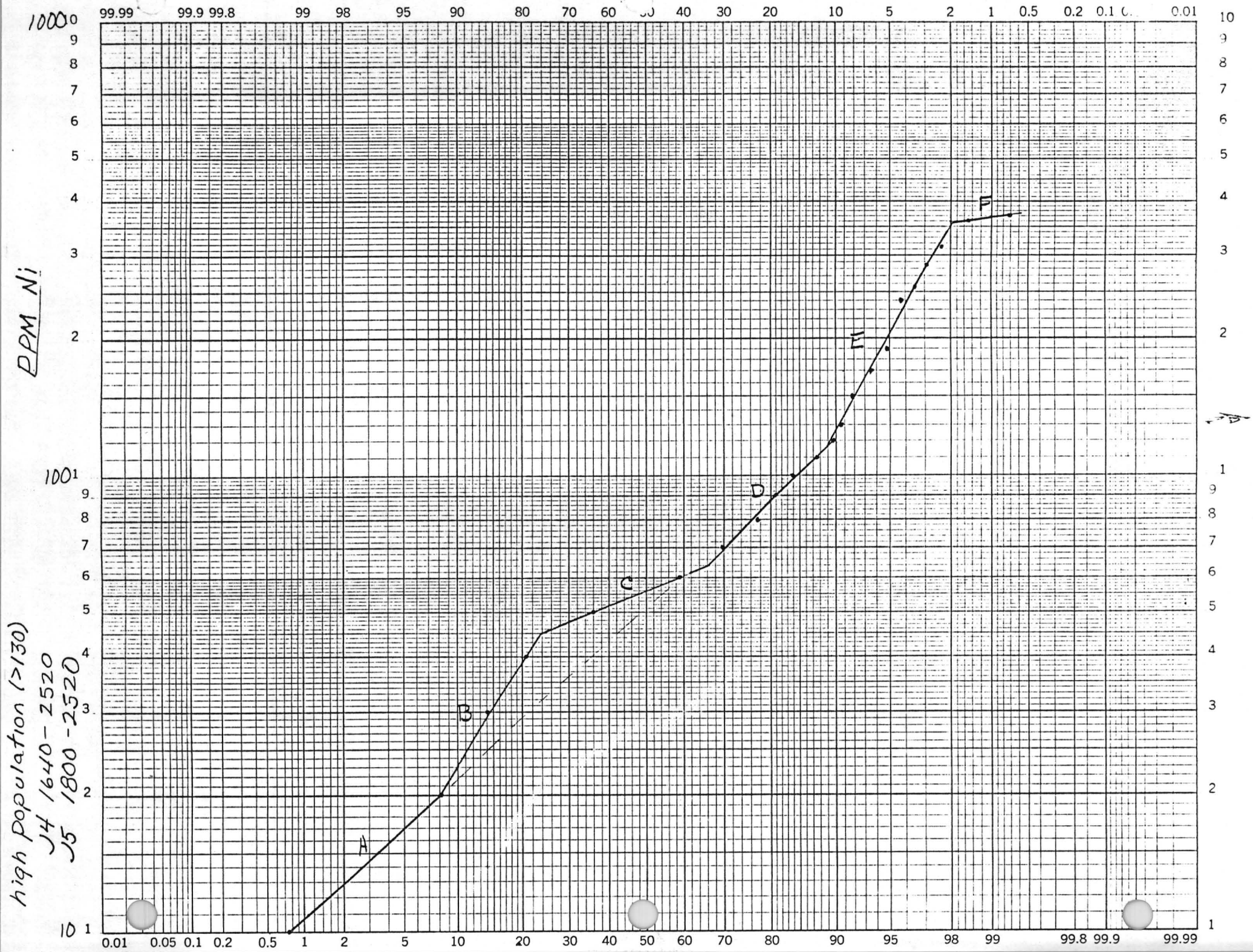
NICKEL



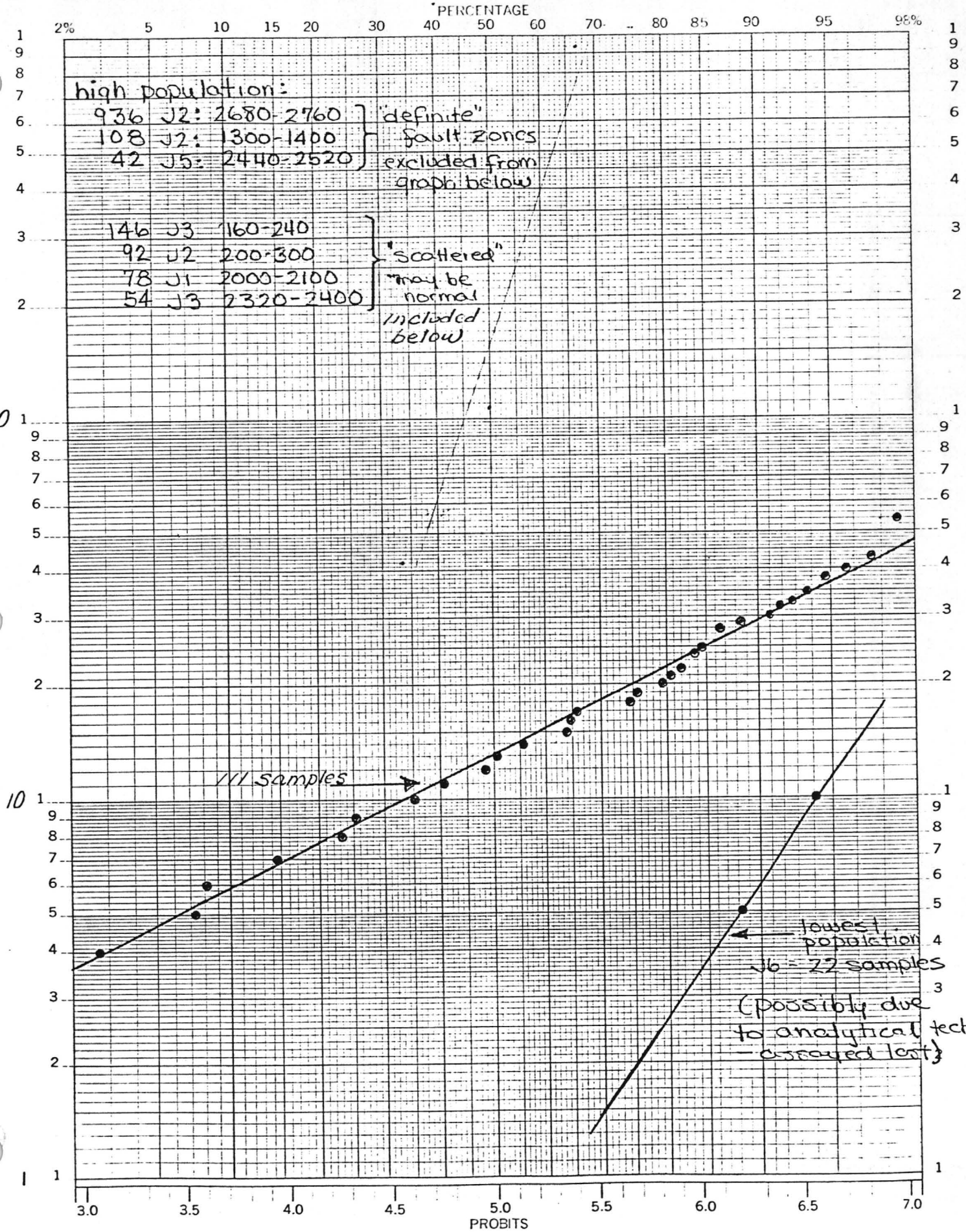
K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

NICKEL

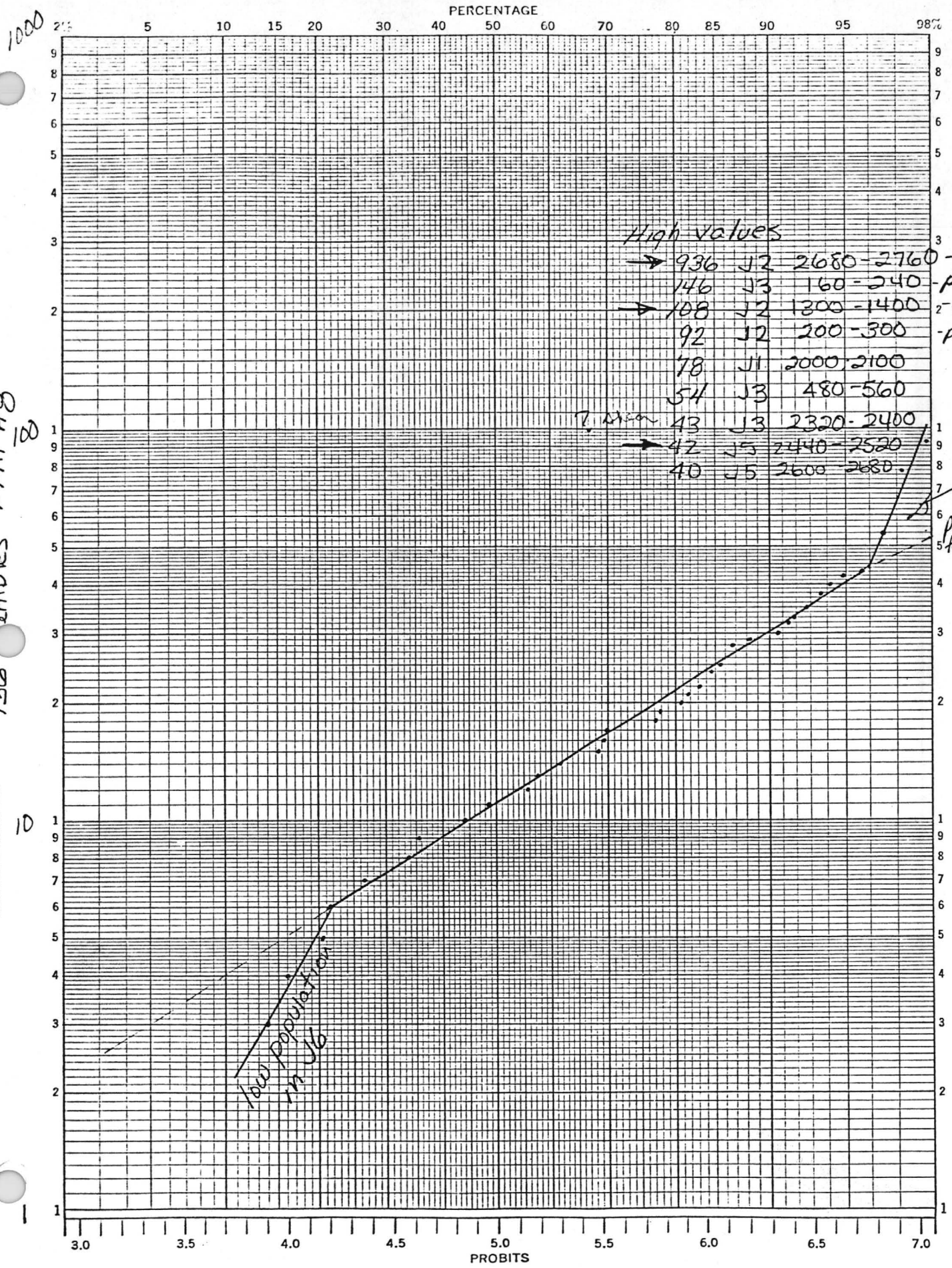


SILVER

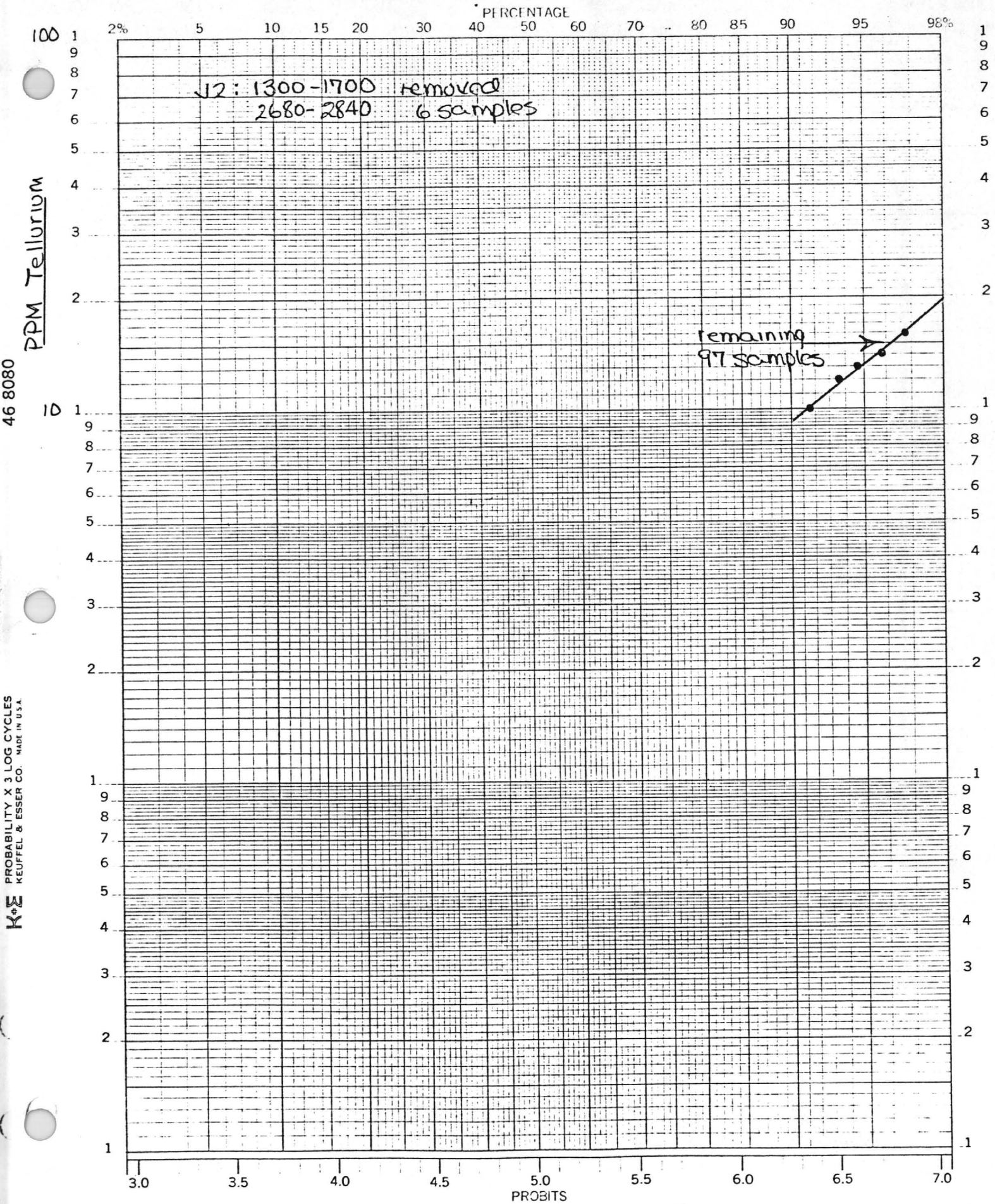


K+E PROBABILITY X 3 LOG CYCLES KEUFFEL & ESSER CO. MADE IN USA
46 8080

(Ag) Silver


PERCENTAGE
2% 5 10 15 20 30 40 50 60 70 80 85 90 95 98%
PROBITS
3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
1000
100
10
1
136 samples PPM Ag
High values
936 J2 2680-2760 - fault
146 J3 160-240 - poss fit
108 J2 1300-1400 - fault
92 J2 200-300 - poss fit
78 J1 2000-2100
54 J3 480-560
? Mon 43 J3 2320-2400
42 J5 2440-2520
40 J5 2600-2680
J2-J3 scattered
poss. related to post min(?) faults
low population in J6
PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO.
MADE IN U.S.A.
46 8080

TELLURIUM

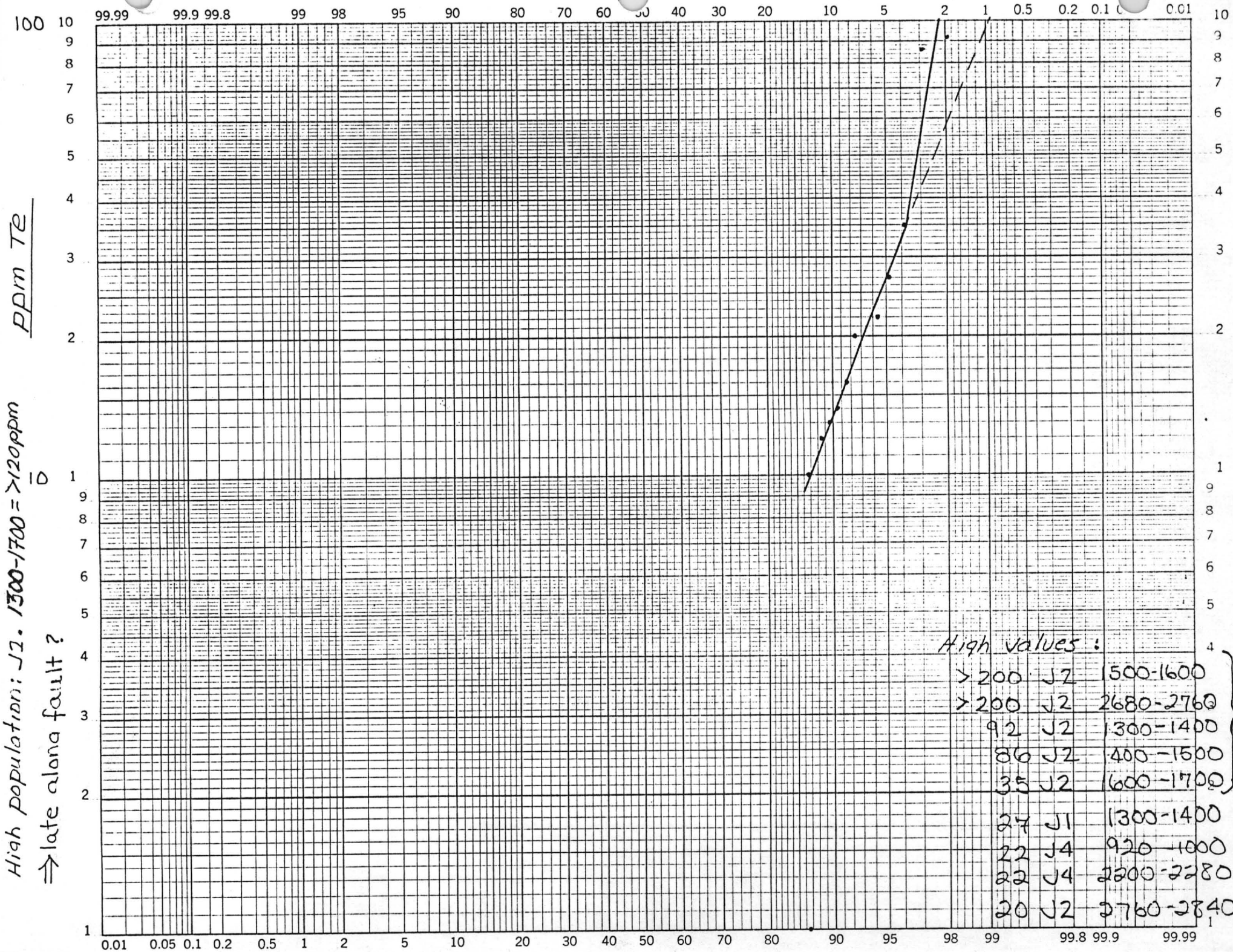


46 8080
K+E PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

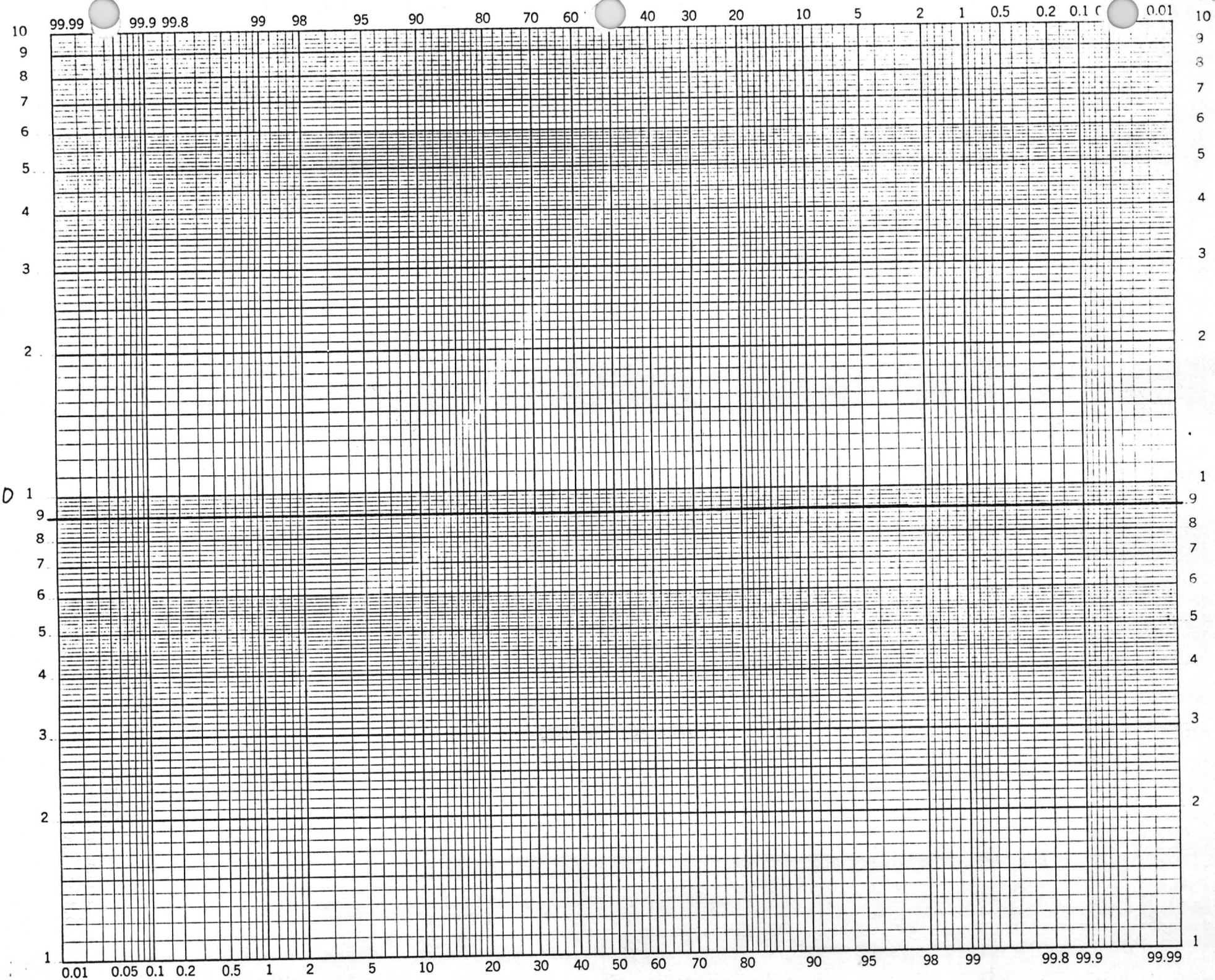
Tellurium



K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

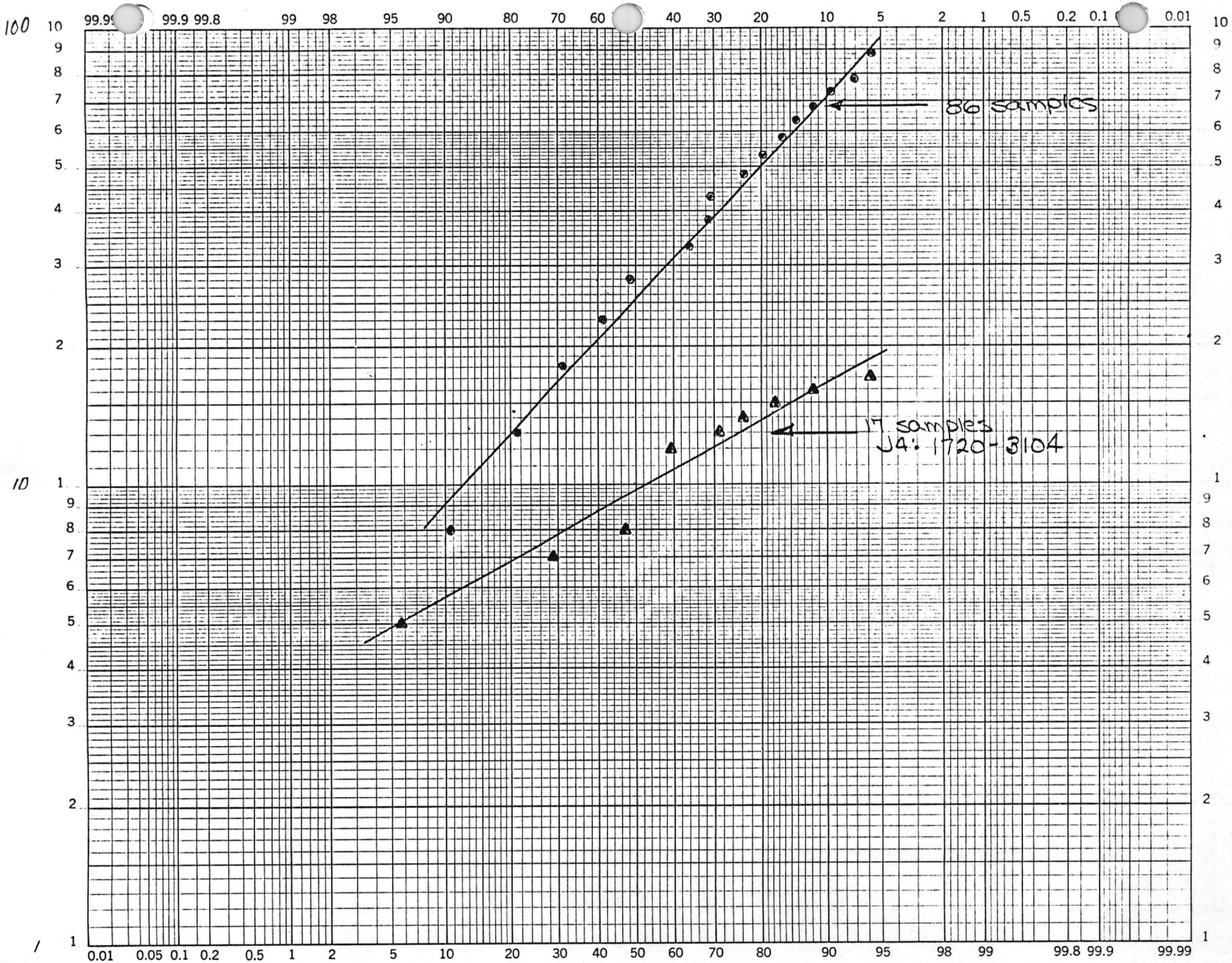
46 8040

Thallium



K+E PROBABILITY X 2 LOG CYCLES KEUFFEL & ESSER CO. MADE IN U.S.A. 46 8040

TIN

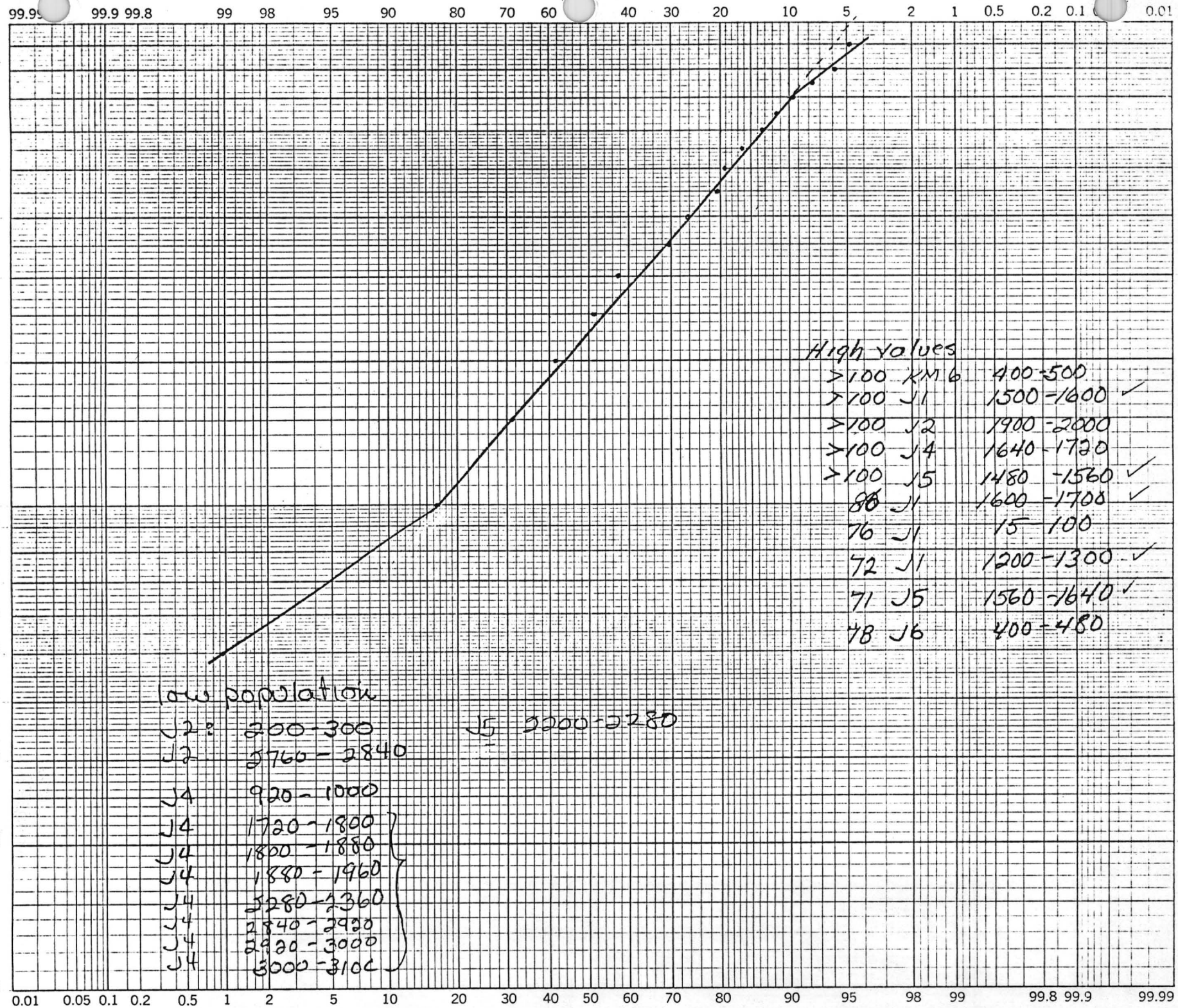


K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

TIN

PPM Sn



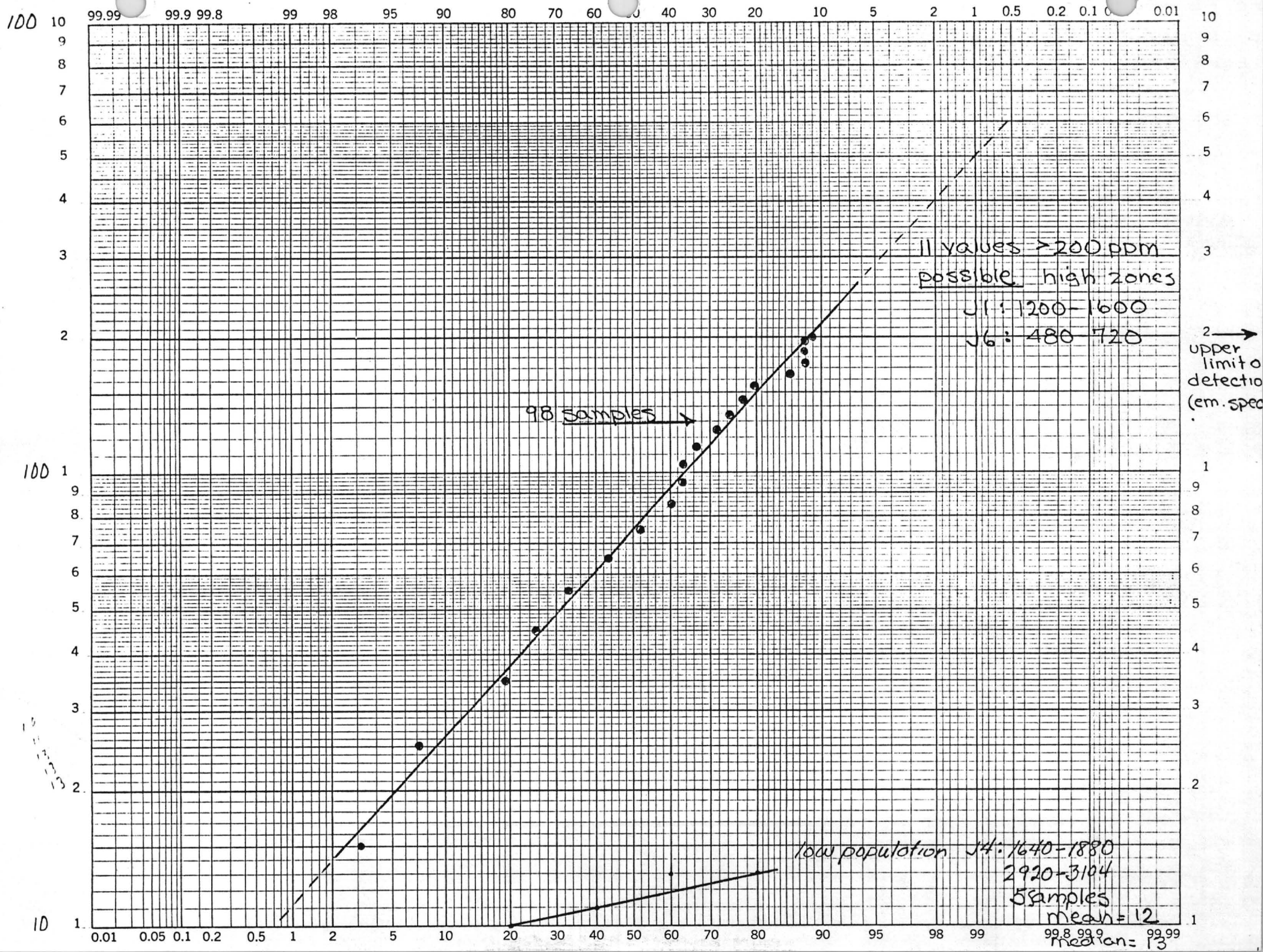
J1: 1200-1700
J5: 1480-1640

Iron = J4 1720-3104

K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

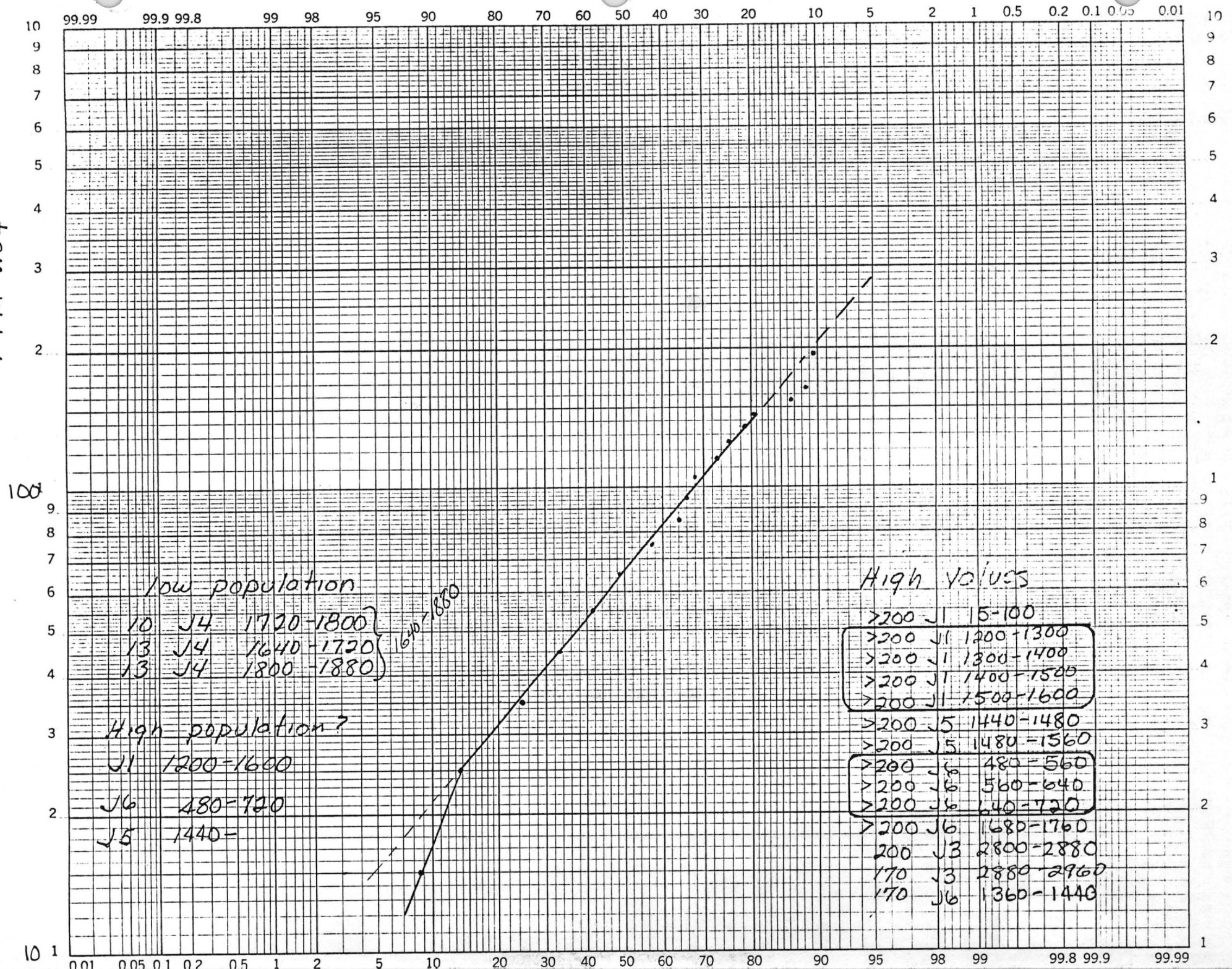
46 8040

TUNGSTEN



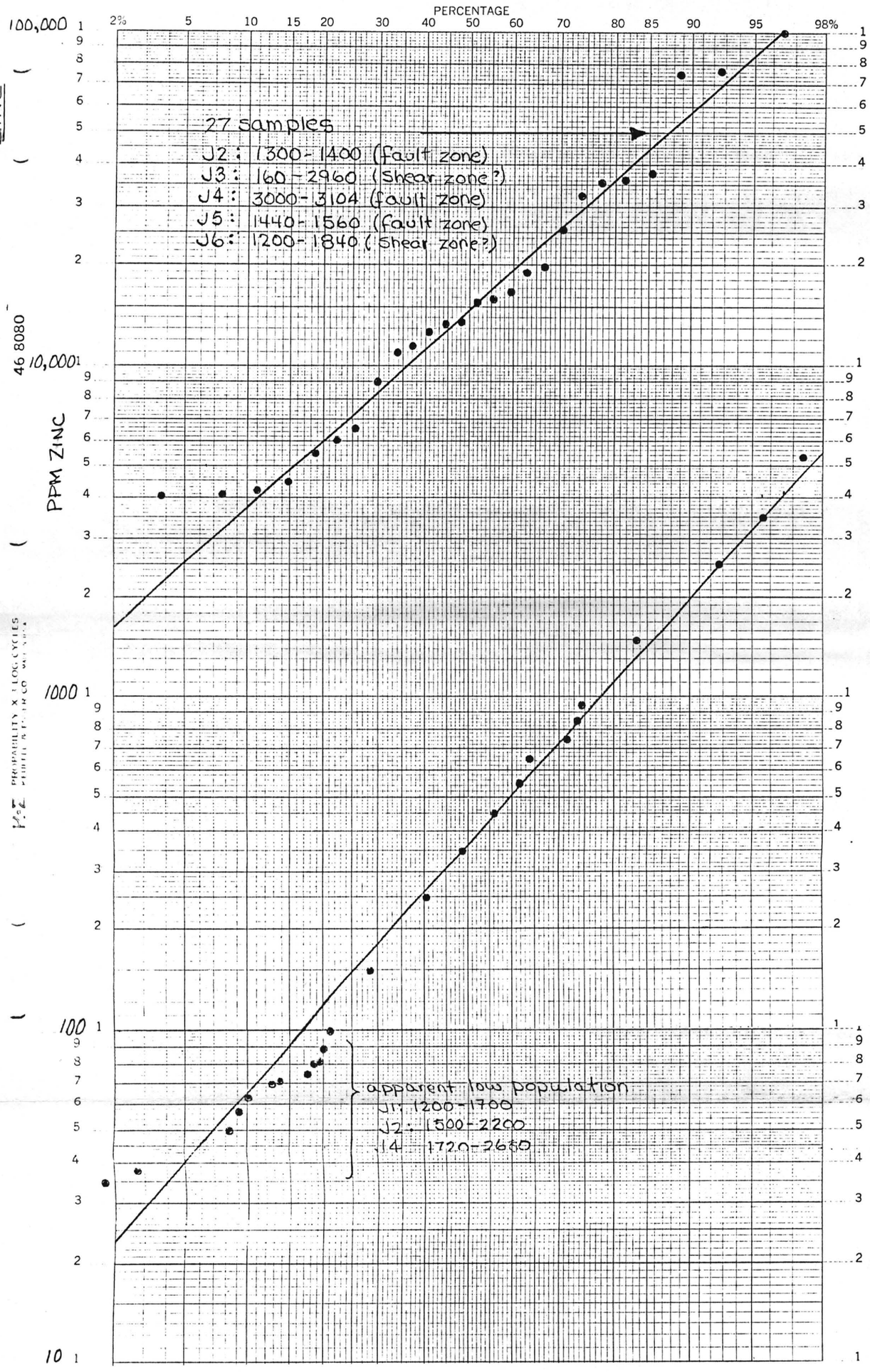
K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040



Highest Values
Lowest Values
Middle
Upper
Middle
Upper
Lower
Lower
PPM Zinc

ZINC



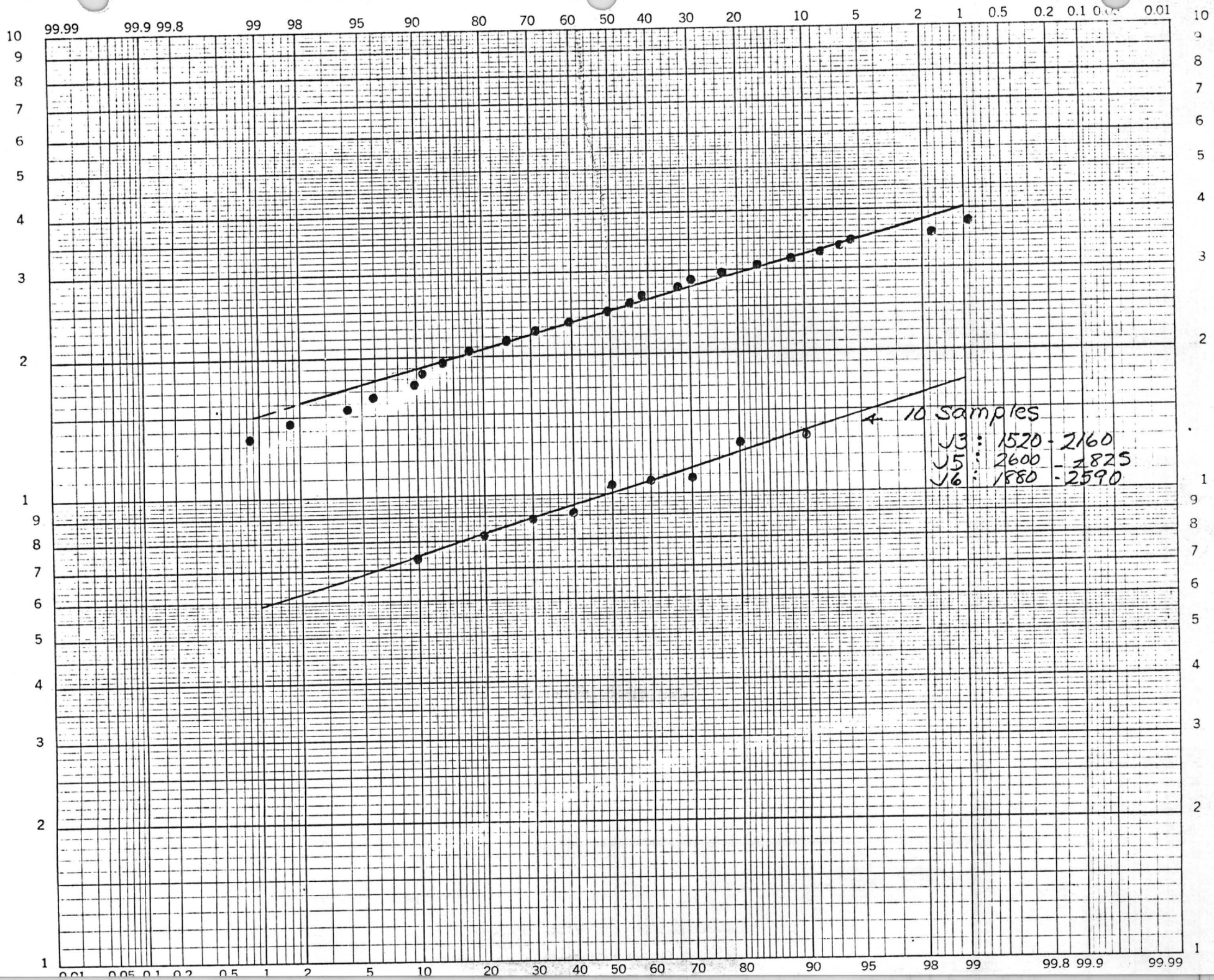
ZINC

46 8080

PROBABILITY X LOG CYCLES

K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

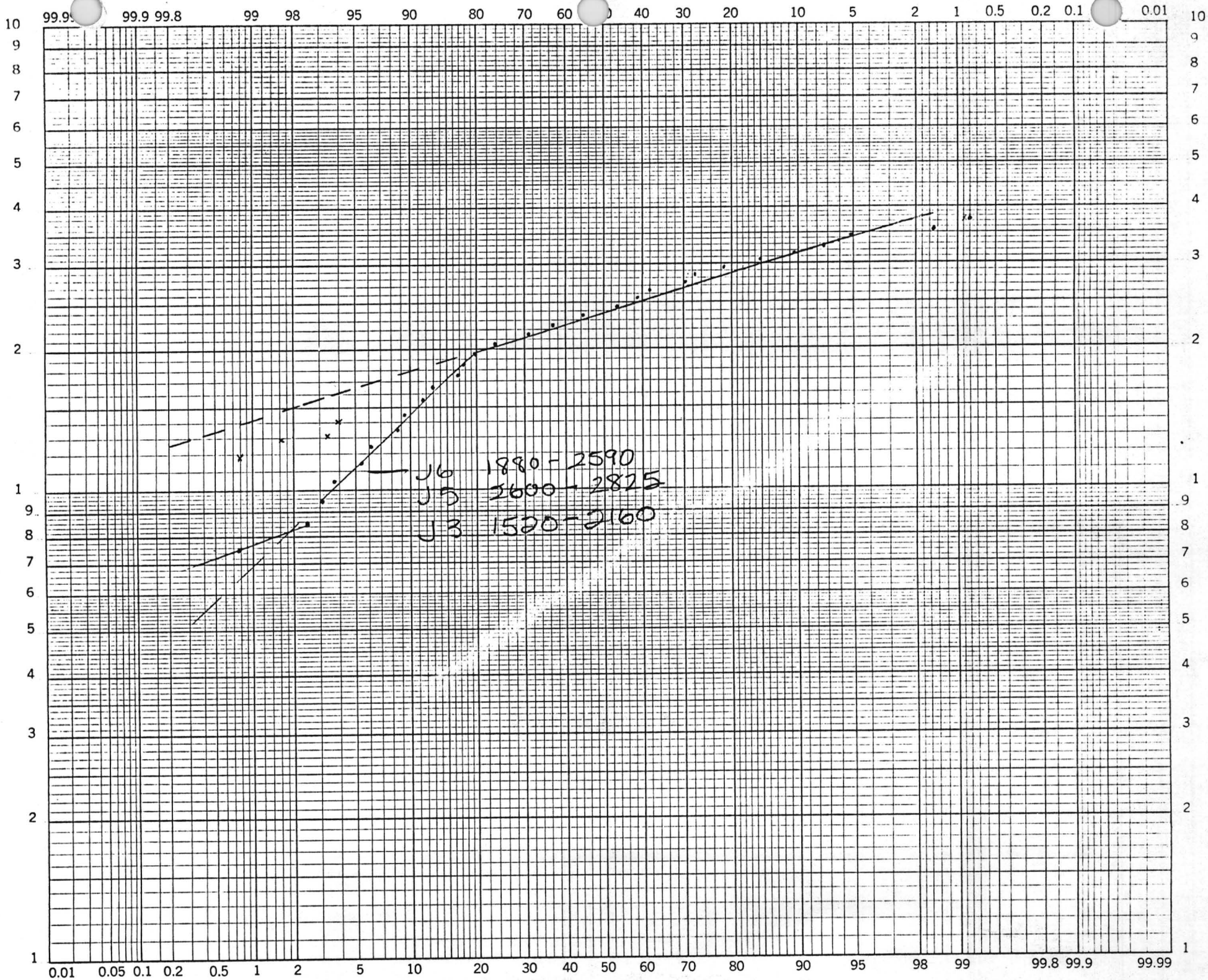
46 8040



K+E PROBABILITY X 2 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 8040

Fe 1.88 (u)



SECTION 17

INDUCED POLARIZATION AND

RESISTIVITY SURVEY

KELVIN-JOHNSON PROJECT

SOUTH HALF, SECTION 16; T4S, R13E

PINAL COUNTY, ARIZONA

FOR

CITIES SERVICE MINERALS CORPORATION

PROJECT 0525

mining
geophysical surveys

TABLE OF CONTENTS

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INTRODUCTION	1
SUMMARY	1
SURVEY PROCEDURE	2
INTERPRETATION	3

ACCOMPANYING THIS REPORT:

1 LOCATION MAP
6 GRADIENT ARRAY SKETCH MAPS
1 POLE-DIPOLE EXPANDER
1 SPEC SHEET OF OPERATING PARAMETERS FOR R10A RECEIVER

DISTRIBUTION:

Original & 2 copies: Jack L. Young, Tucson

INDUCED POLARIZATION AND
RESISTIVITY SURVEY
KELVIN-JOHNSON PROJECT
SOUTH HALF, SECTION 16; T4S, R13E
PINAL COUNTY, ARIZONA

FOR

CITIES SERVICE MINERALS CORP.

INTRODUCTION:

During the period of May 16 through 20th, 1975, an induced polarization and resistivity survey was performed on the titled property. The field survey was under the direction of Adam L. Sotelo, technician; the report by W. Gordon Wieduwilt, geophysicist, for Mining Geophysical Surveys.

A gradient electrode array was used for the survey and was laid out by Jack L. Young, geophysicist for Cities, as shown on the accompanying location map. The sketch plan maps of the various data more accurately position the data points within the grid.

SUMMARY:

An increase in the IP response at the NW corner of the half section surveyed suggest that anomalous IP response occurs in and adjacent to that area. A second trend of slightly higher IP response values occurs along the east edge of the area and is a possible continuation of the response zone to the east. The gross IP trend strikes SE trending toward E'ly.

Relatively high resistivity values of 250-600 ohmmeters occur

throughout the area without any strong contrasts. A trend of higher resistivity values of >400 ohmmeters strikes E'ly to NE'ly through the middle of the area from the west. Lower resistivity values of a linear nature surround this trend. There is no apparent correlation between the IP response and resistivity trends as expressed by this survey.

SURVEY PROCEDURE:

The induced polarization and resistivity measurements are made in the time-domain mode of operation. A conventional system of measurements which uses a time cycle of 2.0 seconds "on" and 2.0 seconds "off" - 2.0 seconds "on" and 2.0 seconds "off" (current reversed) was employed. Elliot 10 amp Transmitter used

An Elliot Model R10A receiver was used and measurements were obtained for four channels (windows) and a composite of response with the time characteristics as shown on the attached manufacturer's specification sheet for the receiver used.

The commencement of the measurement of the secondary voltage is delayed by 0.50 seconds to avoid coupling and other transient effects. The integration is performed during the period from 0.50 seconds to 1.70 seconds after the cessation of current.

To conform to a standard presentation, the integral time constant is adjusted to give induced polarization readings equivalent to those obtained with transmitter cycles of 3.0 seconds "on" and 3.0 seconds "off", with integration of the secondary

voltage during the first second of the "off" period.

A gradient electrode array was used with two N-S reference current electrodes placed 10,000' apart, straddling the half section (16) to be surveyed. A 500' potential dipole was used for the survey and occupied stations at 500' intervals along N-S profiles. The line interval was set at 500' as well. All data is plotted to the midpoint of the potential dipole. In addition to the gradient array, one pole-dipole test expander was surveyed from Line 3, 15N, using a 500' dipole. The data from the expander is presented on a log-log plot.

Apparent polarization response is in units of millivolt-seconds-per-volt, or milliseconds (ms), and apparent resistivity is in units of ohmmeters. The data for the composite IP response, the apparent resistivity, and each of the four channels of IP data is presented in plan.

INTERPRETATION:

The potential distribution from a gradient array survey can be compared to the horizontal component of the Earth's magnetic field for interpretation purposes. However, a rigorous interpretation of electrical disturbances using this approach is of doubtful significance. The gradient array, we feel, is best used as a reconnaissance method where an indication of a contrast in IP response and resistivity is the basis for additional studies using electrode configurations capable of producing data suitable

to a more quantitative interpretation.

The four channels of IP data as recorded here may be helpful in analysing noise and EM coupling characteristics. Their value as a method of separating "type response" materials cannot be ruled out, but has yet to be demonstrated to date.

IP RESPONSE DATA

The composite and each of the four channels of IP response have produced essentially identical patterns. We, therefore, feel that a discussion of the composite data suffices to explain the characteristics seen on all channels.

IP response values increase to the north in the west half of the area, increase to the north in the east central portion, and increase to the north in the east half, but tend to decrease again at the northeast corner of the area. The resultant picture is one of an elongated anomalous zone striking SE'ly to E'ly, with the largest portion of the zone occurring to the northwest, adjacent to the survey area. A test expander was surveyed from Line 3, 15N to the west and indicates IP response of 18-20 ms influences the stations throughout that cross line and to a depth of 1000'+. These values are in keeping with the gradient results. Additional expander tests to analyse the higher response areas to the north might be fruitful towards understanding the source of the anomalous response.

RESISTIVITY DATA

An irregularly-shaped high resistivity trend of 400-600

ohmmeters strikes E to NE'ly from the southwest corner of section 16. This high resistivity trend appears interrupted, but may continue to the NE as evidenced by the high resistivity values in the NE corner of the area. A somewhat linear characteristic is expressed in the low resistivity material where resistivities of 250 ohmmeters trend E to NE'ly adjacent to the high resistivity zone. The resistivity boundaries are not sharply defined as a very small contrast in resistivity occurs throughout the area. The test expander indicates a resistivity of 300 ohmmeters for a distance of 1500' ± 250' west of C_1, where a near-surface contact is crossed. The resistivity locally west of the contact is estimated at about 600 ohmmeters. Lower resistivity values occur at depth or adjacent to the expander profile, influencing the apparent resistivity at the larger separations.

Respectfully submitted,

W. Gordon Wieduwilt
Geophysicist

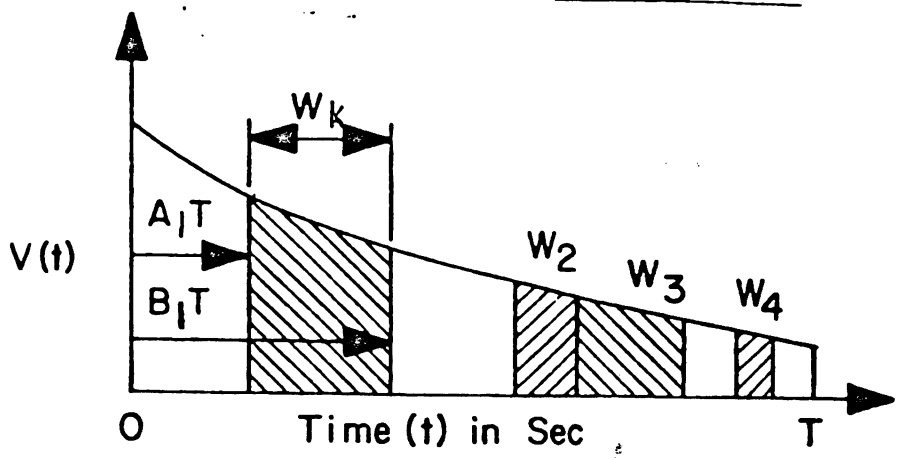
Registered Professional Engineer (Geophysical)
CERTIFICATE NO. 8842
W. GORDON WIEDUWILT
DATE SIGNED 6/3/75
Arizona U. S. A.

May 2, 1975
Tucson, Arizona

SPECIFIC OPERATING PARAMETERS
ELLIOT MODEL R10A RECEIVER

DATE 2/13/75

UNIT	S/N
Main frame R-10A	1003
Analog PC-159	114
Integrator PC-160	111
Digital PC-155	111
Cal/Scaler PC-161	111



A_kT = Time to Start of kth Integration Window (sec)

B_kT = Time to End of kth Integration Window (sec)

W_k = $(B_kT - A_kT)$ = Width of kth Integration Window (sec)

C_k = Instrument Readout of Chargeability in M_{331} Units (millisec) as Defined by Newmont Exploration Ltd.

RC_k = Integrator Time Constant (sec)

G_k = Output Amplifier Scaler Gain

$$V_k = \frac{(C_k)(RC_k)}{(W_k)(G_k)}$$ = Average Decay Voltage During k^{th} Window $(\frac{mV}{V})$

T = 2.0 Seconds (¼ of Waveform Period)

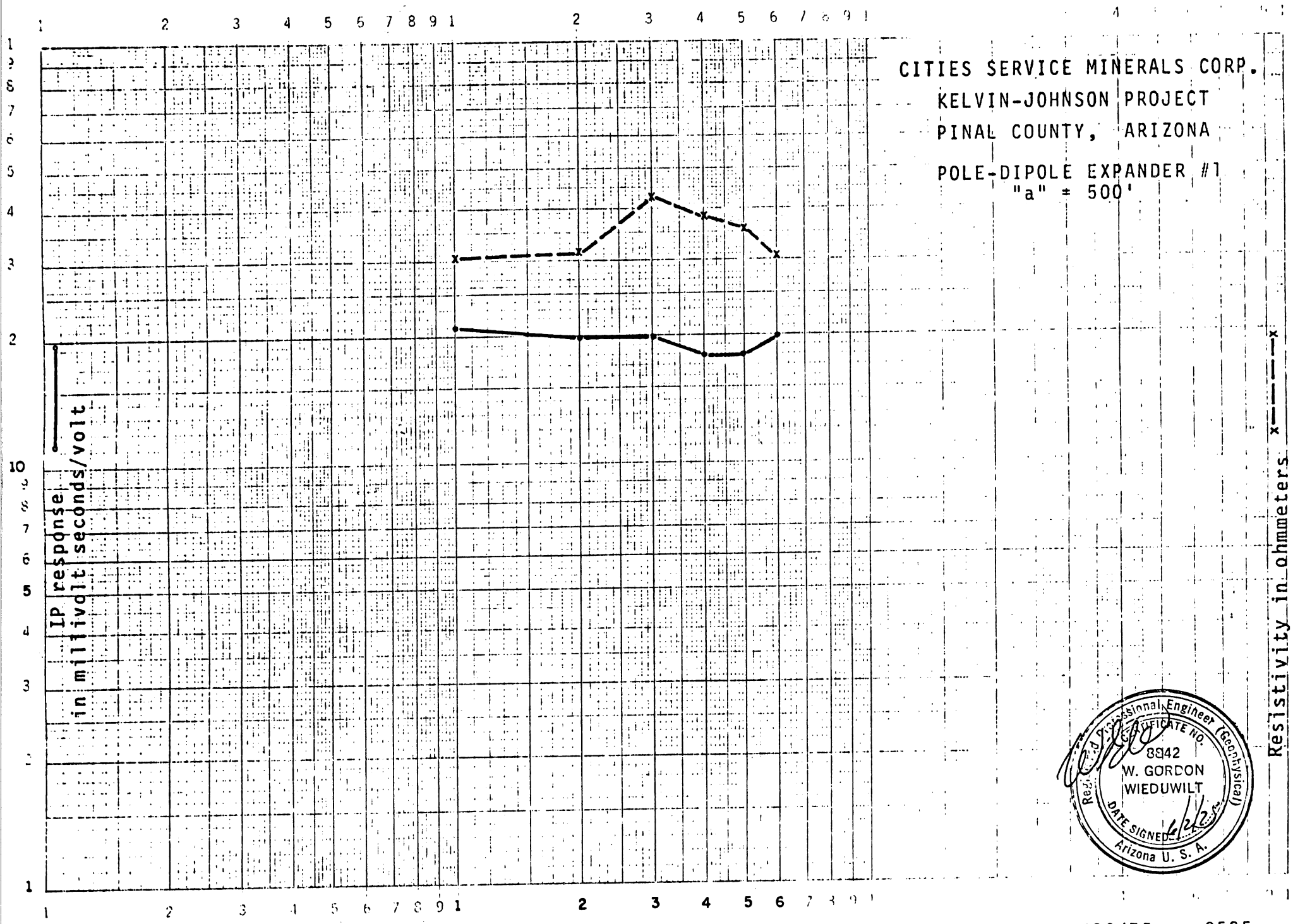
SP Offset Correction Performed at 1.90 Seconds.

Powerline Rejection Frequency = 60 Hertz.

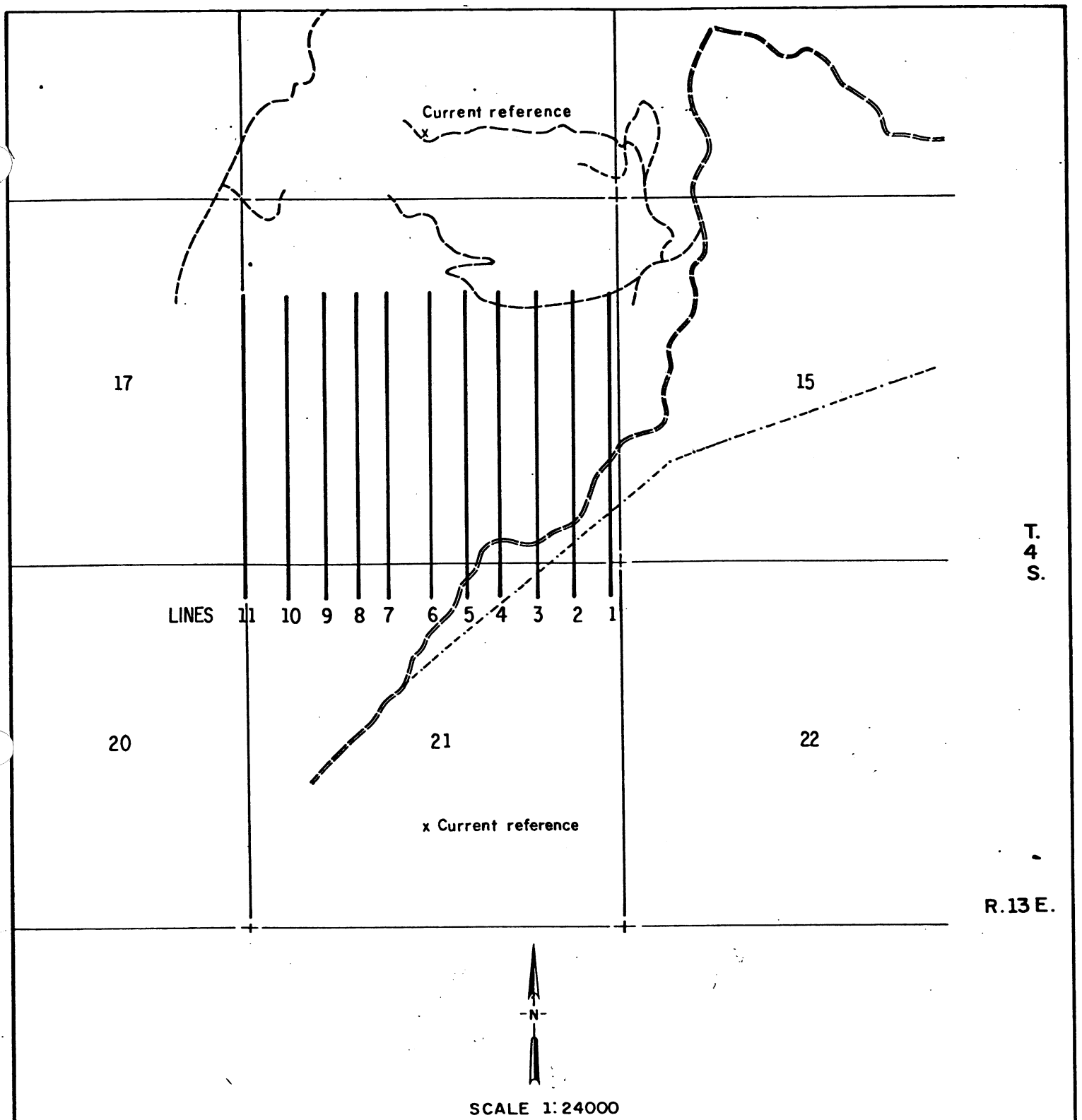
Window No. k	A_kT (sec)	B_kT (sec)	W_k (sec)	RC_k (sec)	G_k	CAL C_k (ms)
1	0.50	0.80	0.30	0.075	0.29	24
2	0.80	1.10	0.30	0.075	0.34	27
3	1.10	1.40	0.30	0.075	0.39	32
4	1.40	1.70	0.30	0.075	0.43	35
Composite	0.50	1.70	1.20	0.075	0.091	30

K+E LOGARITHMIC • 1 X 3 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 7320



5/20/75 0525



SCALE 1:24000

I.P. and RESISTIVITY SURVEY

LOCATION MAP

KELVIN JOHNSON PROJECT

PINAL COUNTY, ARIZONA

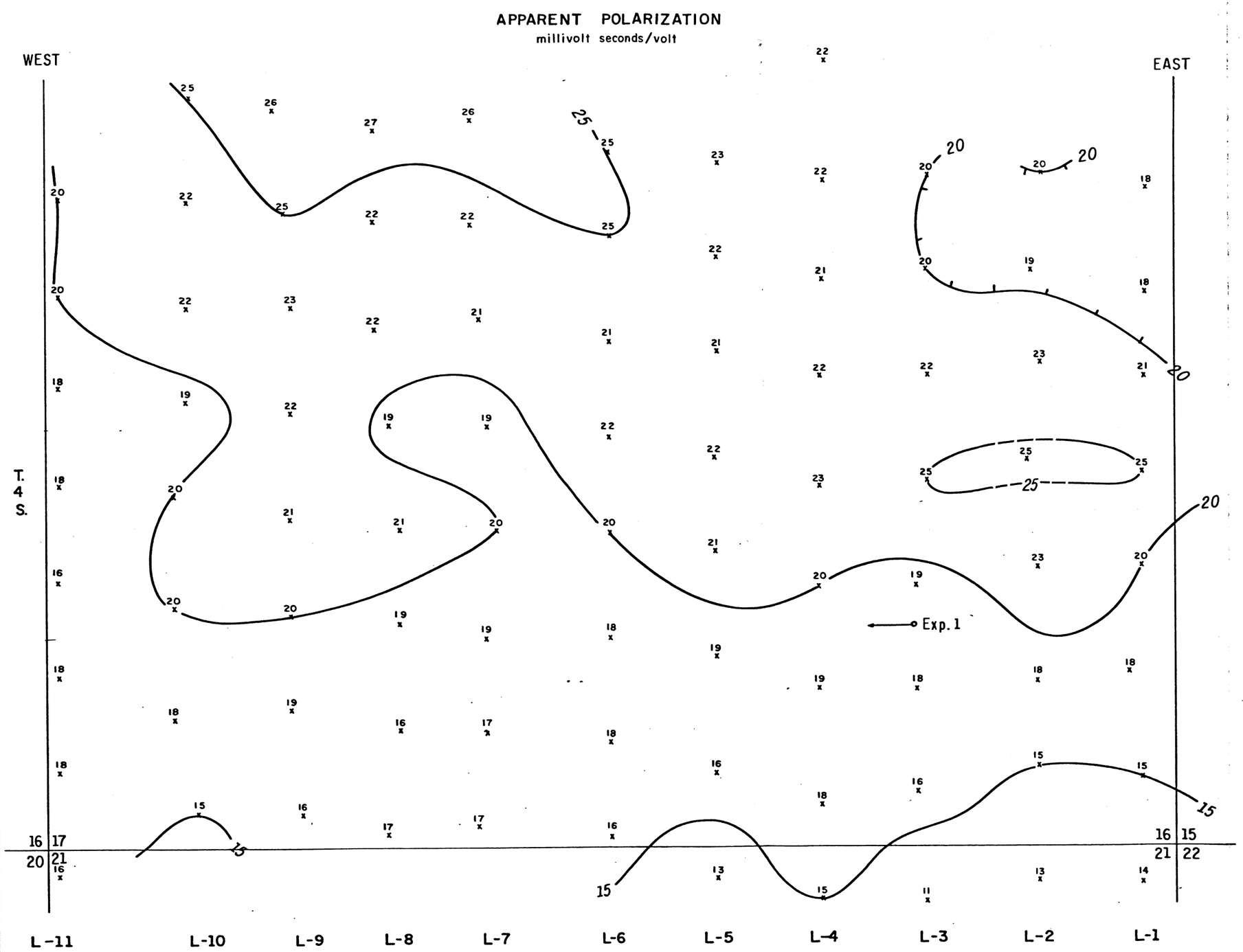
for

CITIES SERVICE MINERALS CORP.

by

mining
geophysical surveys

0525



CONTOUR MAP OF COMPOSITE I.P. RESPONSE

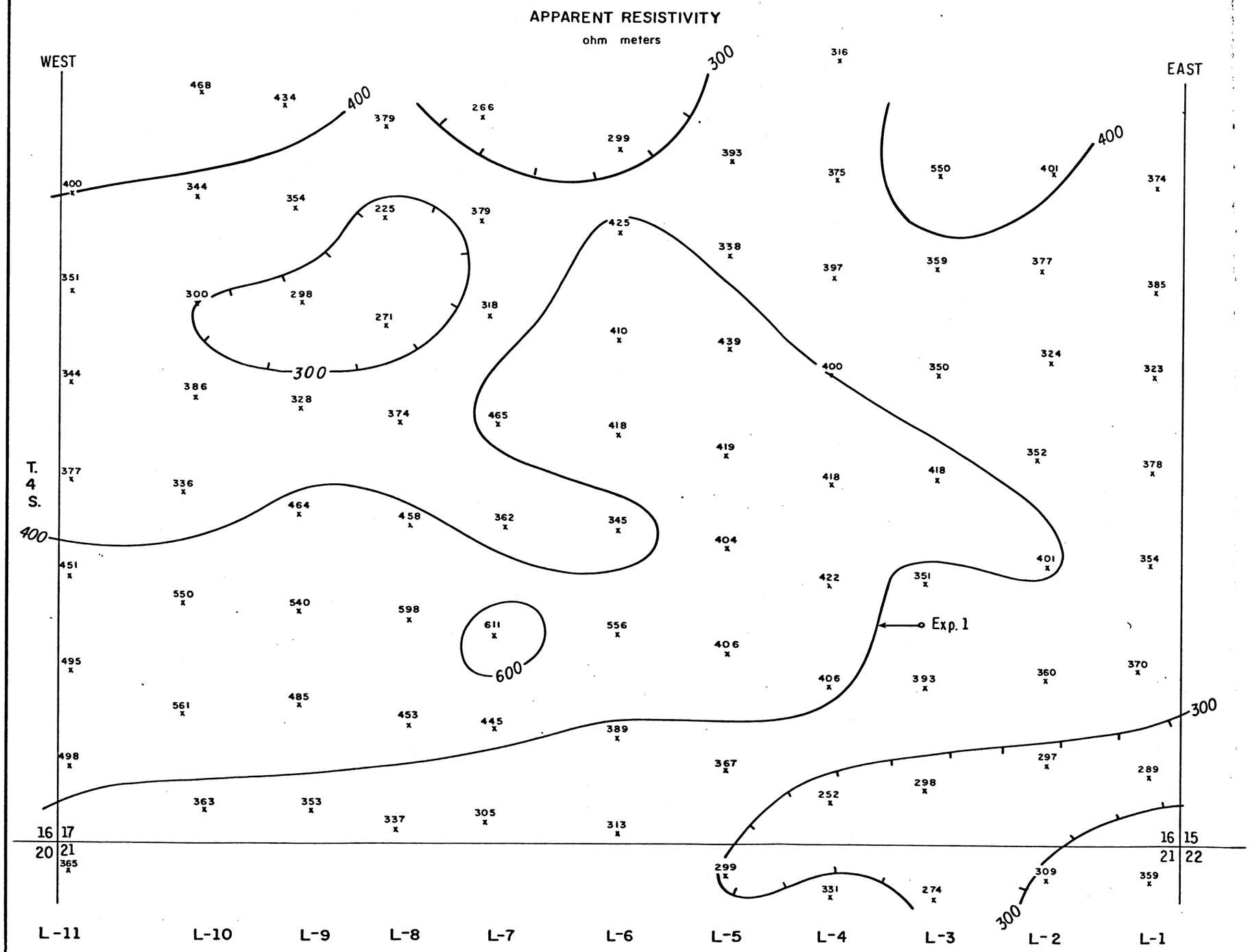
SHEET 1 OF 6

SCALE 1"= 500'

I.P. and RESISTIVITY SURVEY
SKETCH MAP

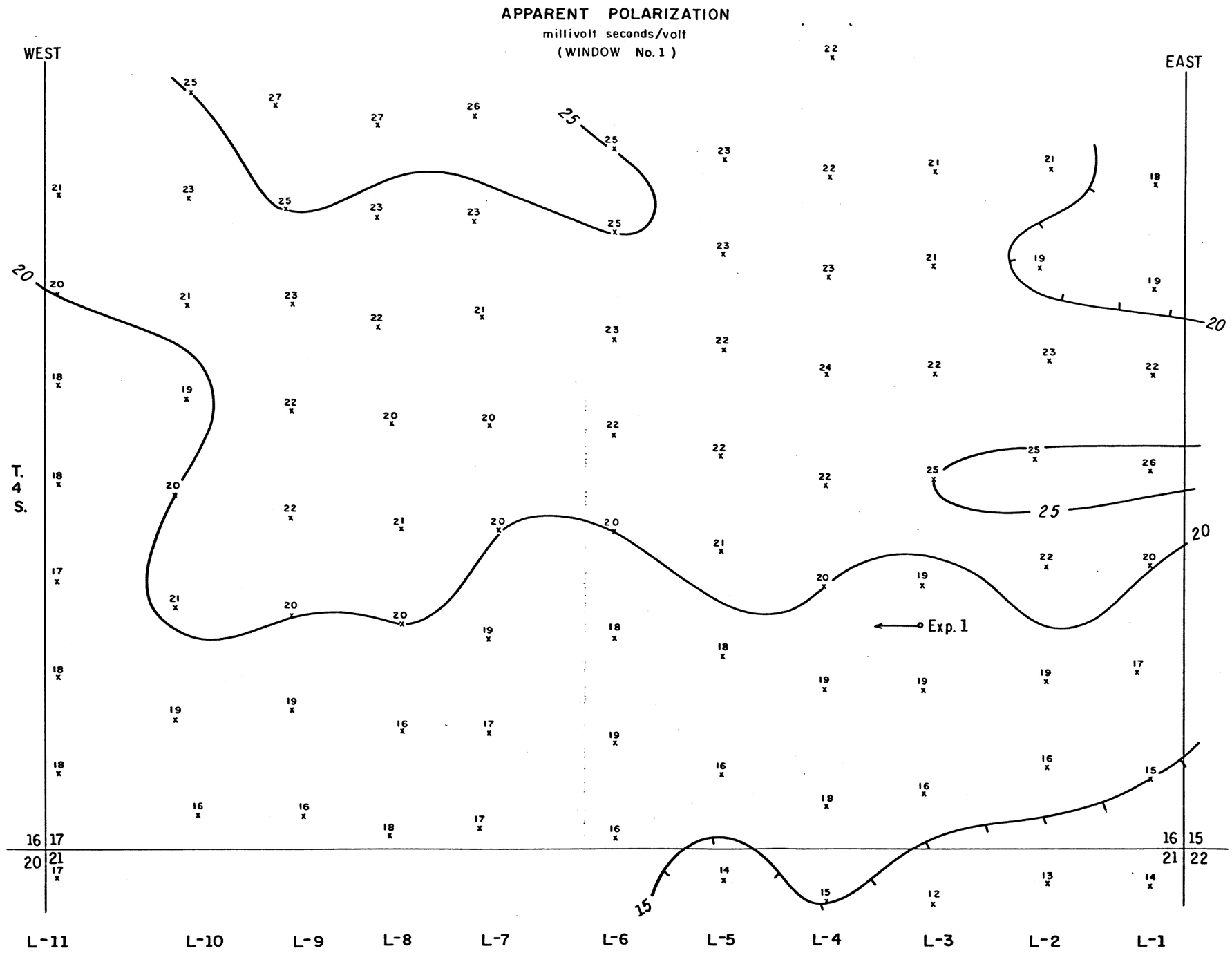
KELVIN JOHNSON PROJECT
PINAL COUNTY, ARIZONA
for
CITIES SERVICE MINERALS CORP.
by

mining geophysical surveys



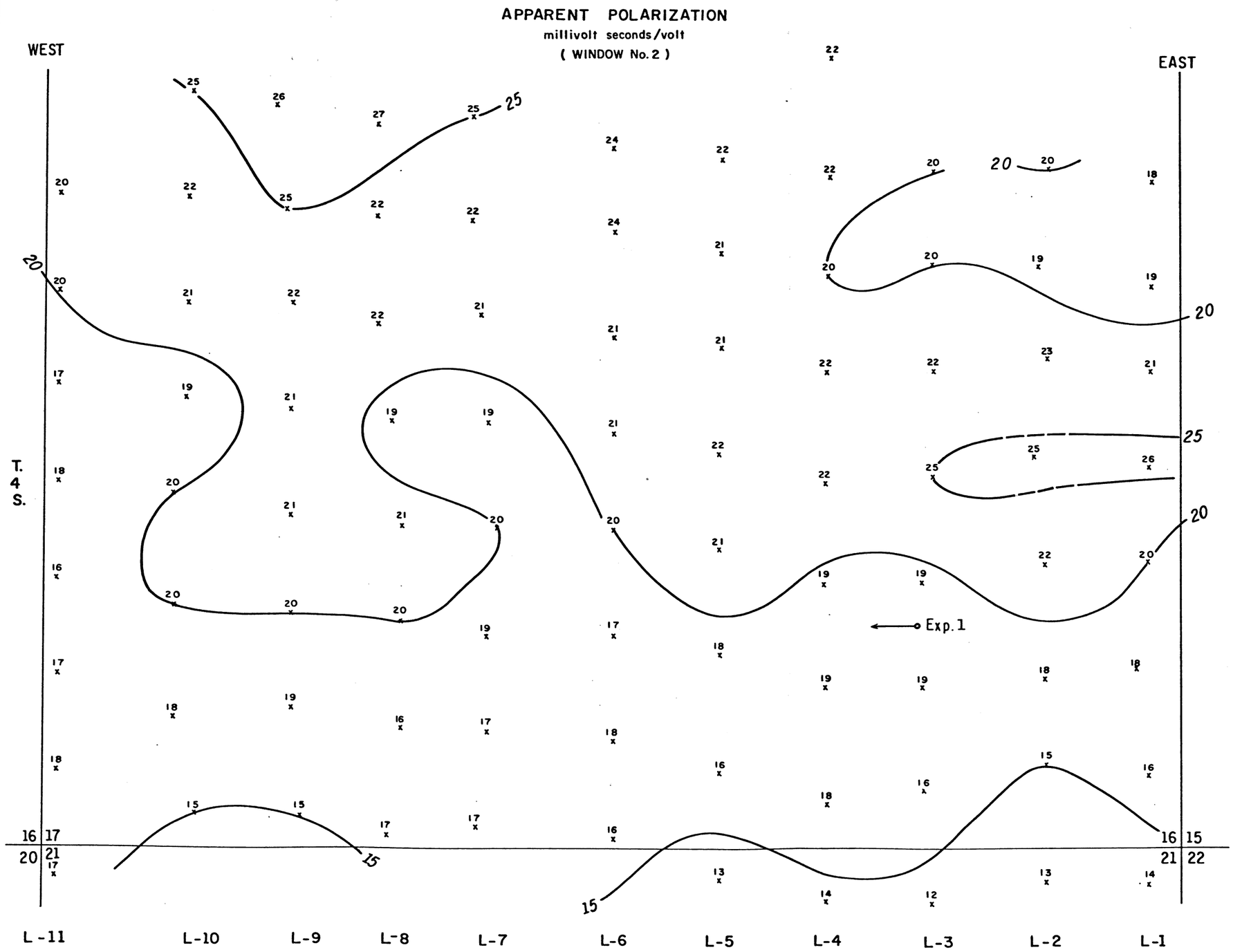
SHEET 2 OF 6

CONTOUR MAP OF APPARENT RESISTIVITIES



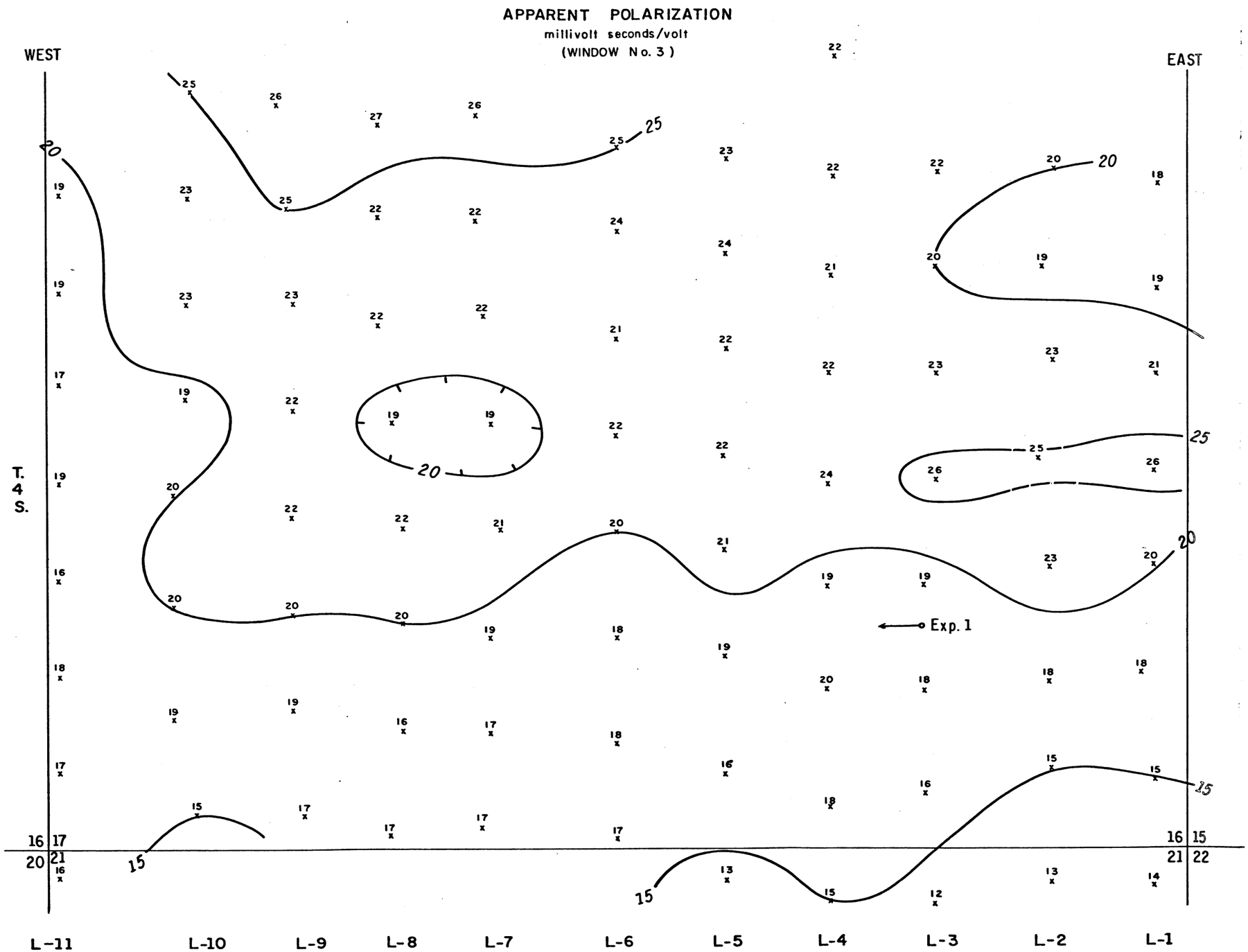
SHEET 3 OF 6

CONTOUR MAP OF APPARENT I.P. RESPONSE
CHANNEL 1



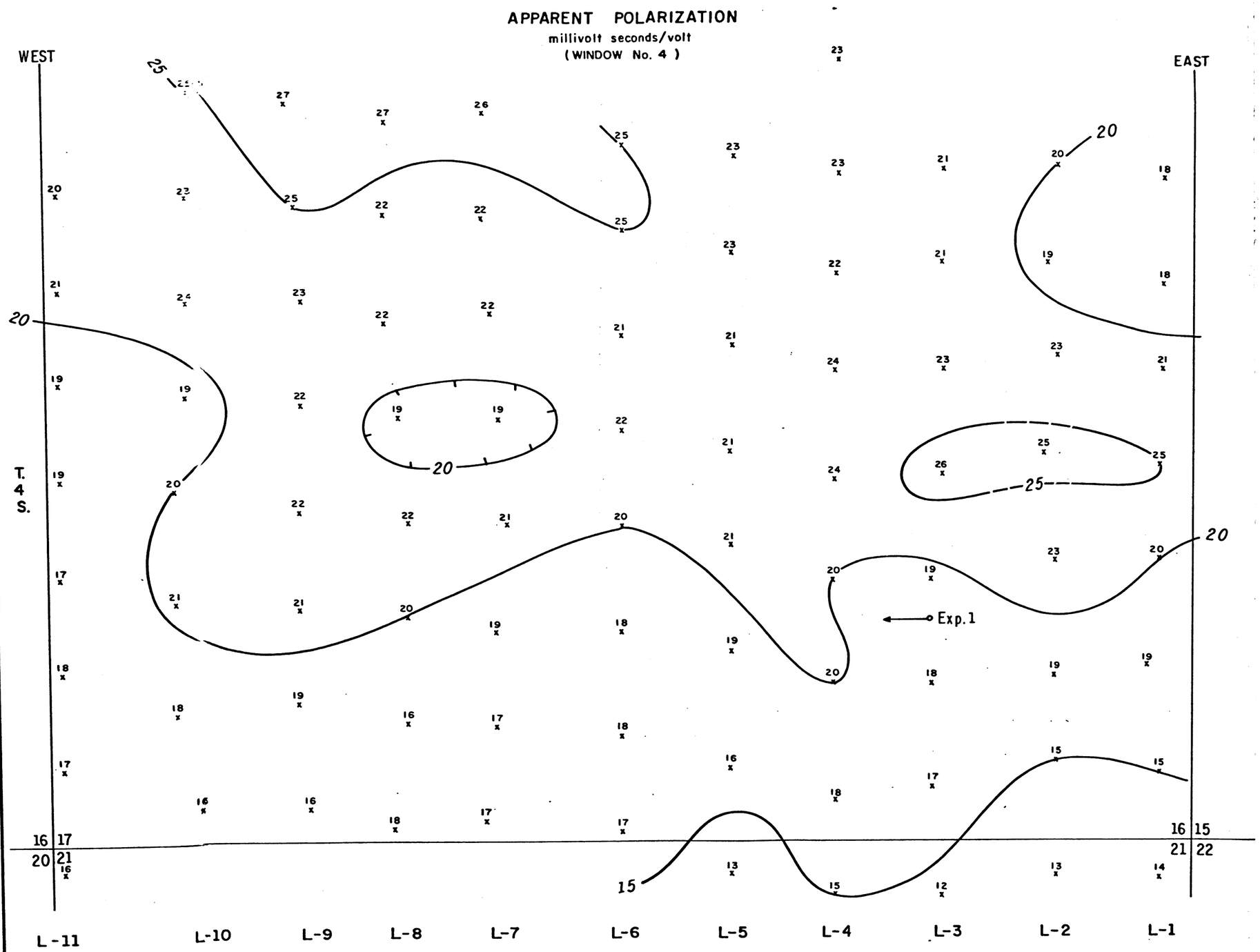
SHEET 4 OF 6

CONTOUR MAP OF APPARENT I.P. RESPONSE
CHANNEL 2



SHEET 5 OF 6

CONTOUR MAP OF APPARENT I.P. RESPONSE
CHANNEL 3



SHEET 6 OF 6

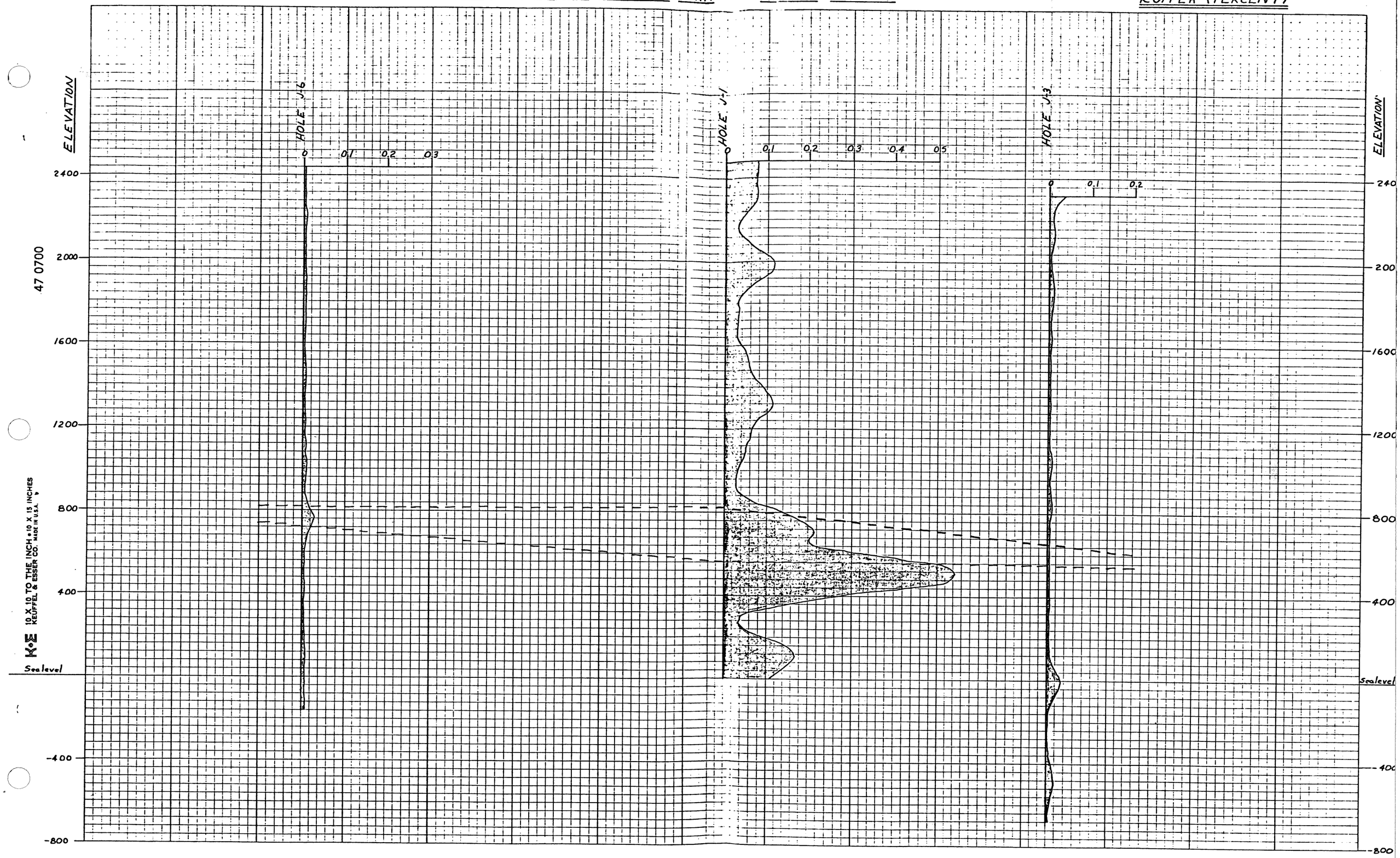
CONTOUR MAP OF APPARENT I.P. RESPONSE
CHANNEL 4

SECTION 18

SECTION 19

CITIES SERVICE MINERALS CORP. KILVIN PROJECT

COPPER (PERCENT)

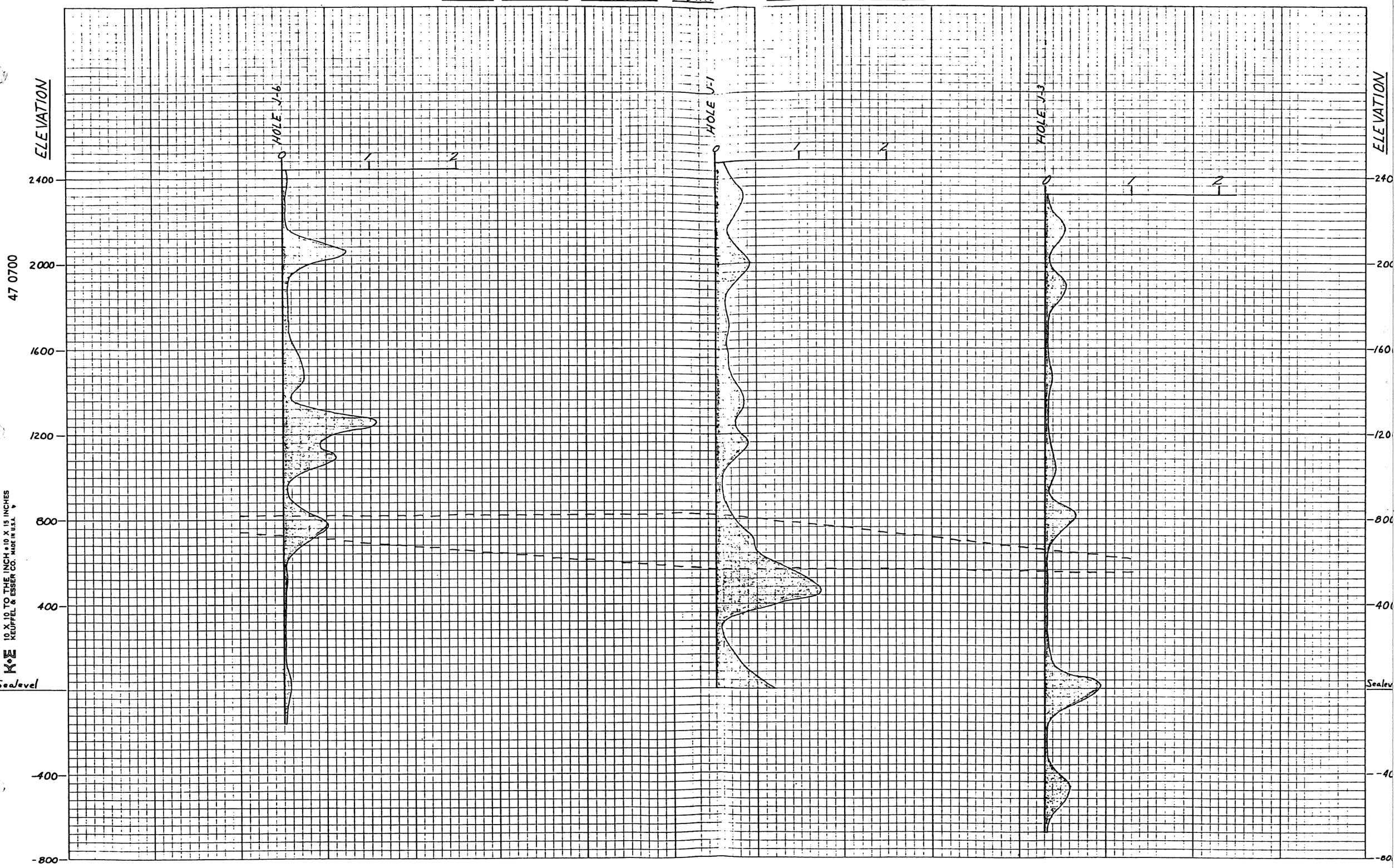


1" = 400'

CITIES SERVICE MINERALS CORP. KILVIN PROJECT MOLYBDENUM (PPM)

K+E 10 X 10 TO THE INCH • 10 X 15 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

CITIES SERVICE MINERALS CORP. KELVIN PROJECT % SULFUR

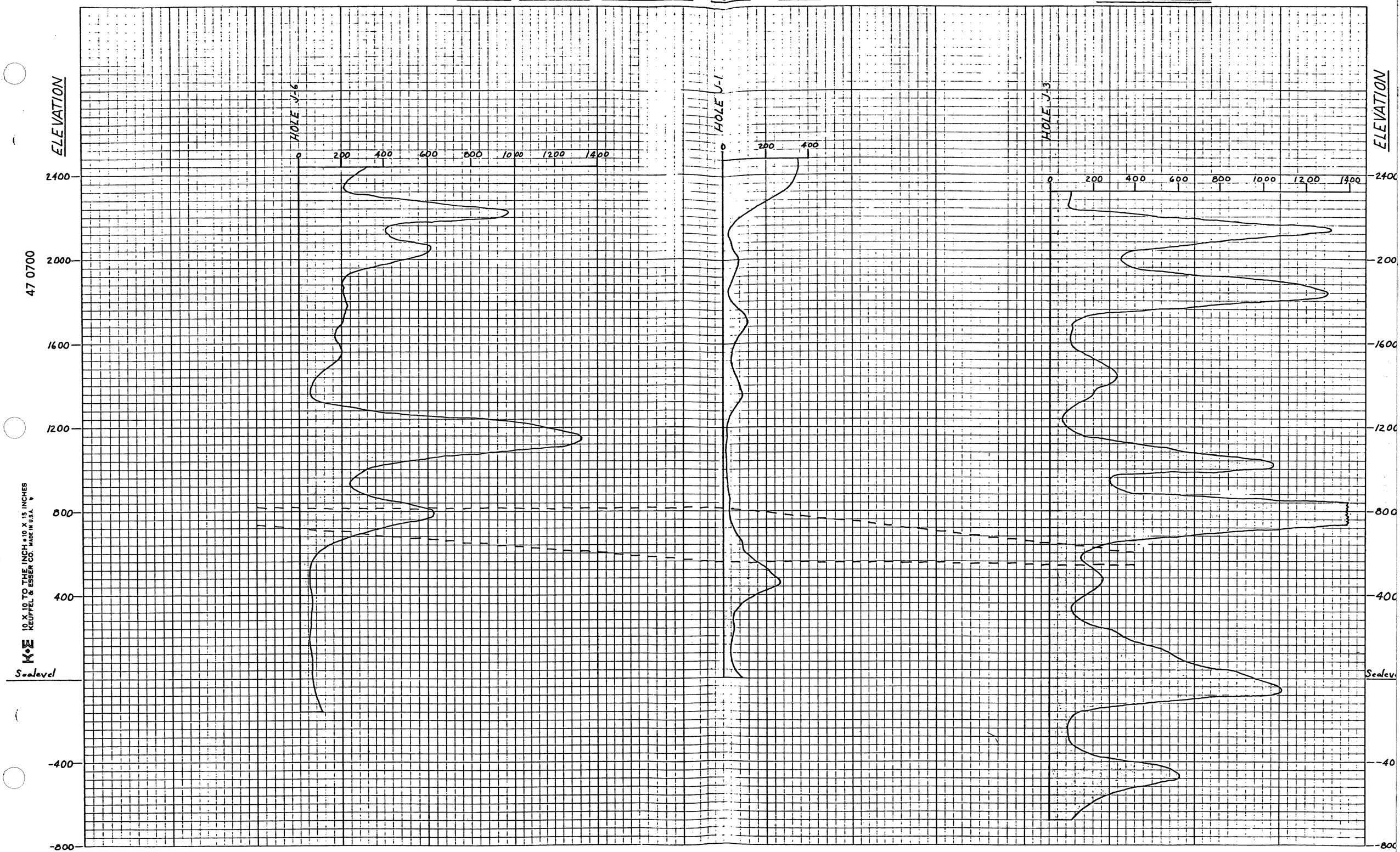


1" = 400'

CITIES SERVICE MINERALS CORP. KELVIN PROJECT PYRITE ÷ CHALCOPYRITE

CITIES SERVICE MINERALS CORP. KELVIN PROJECT

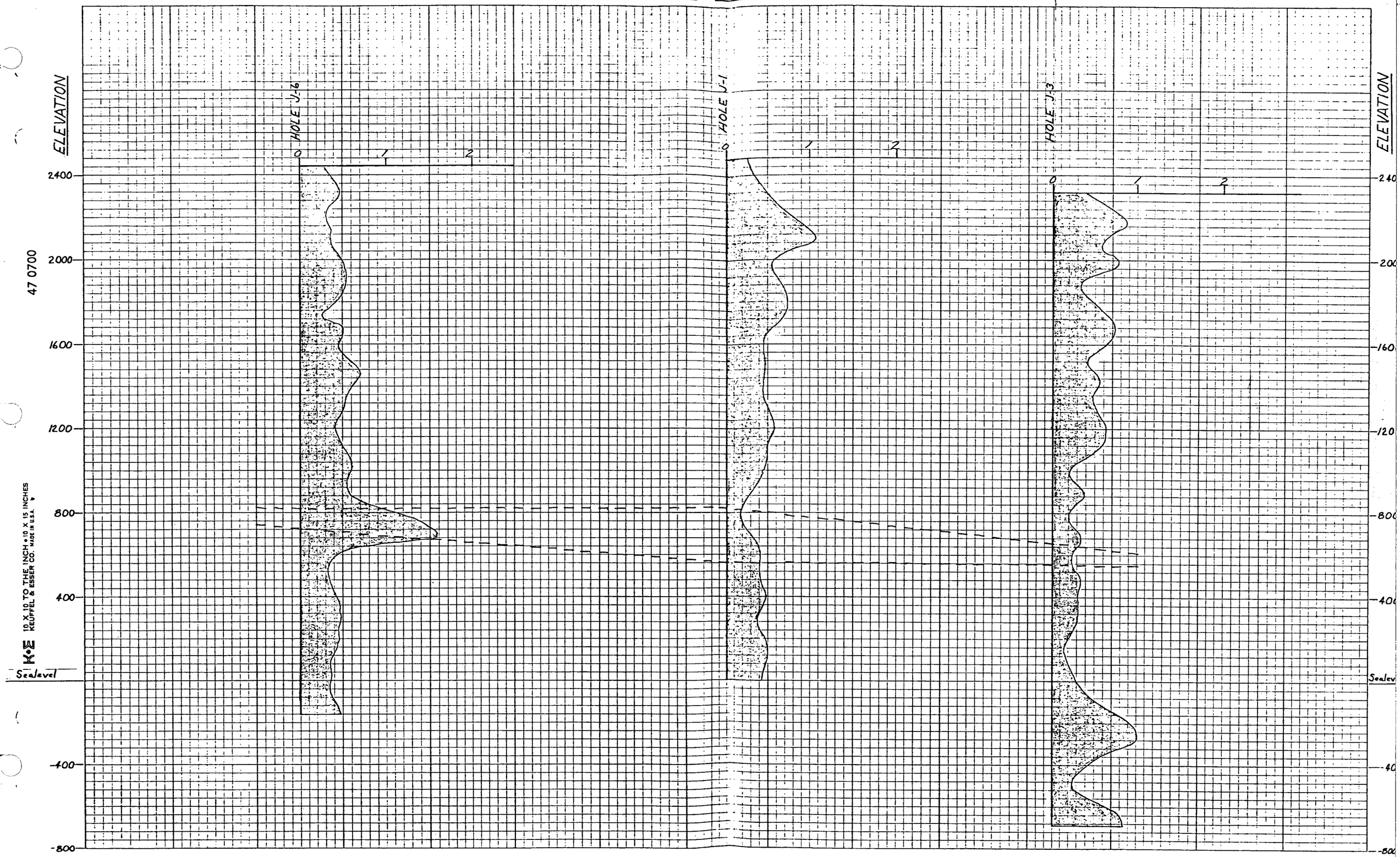
ZINC (PPM)



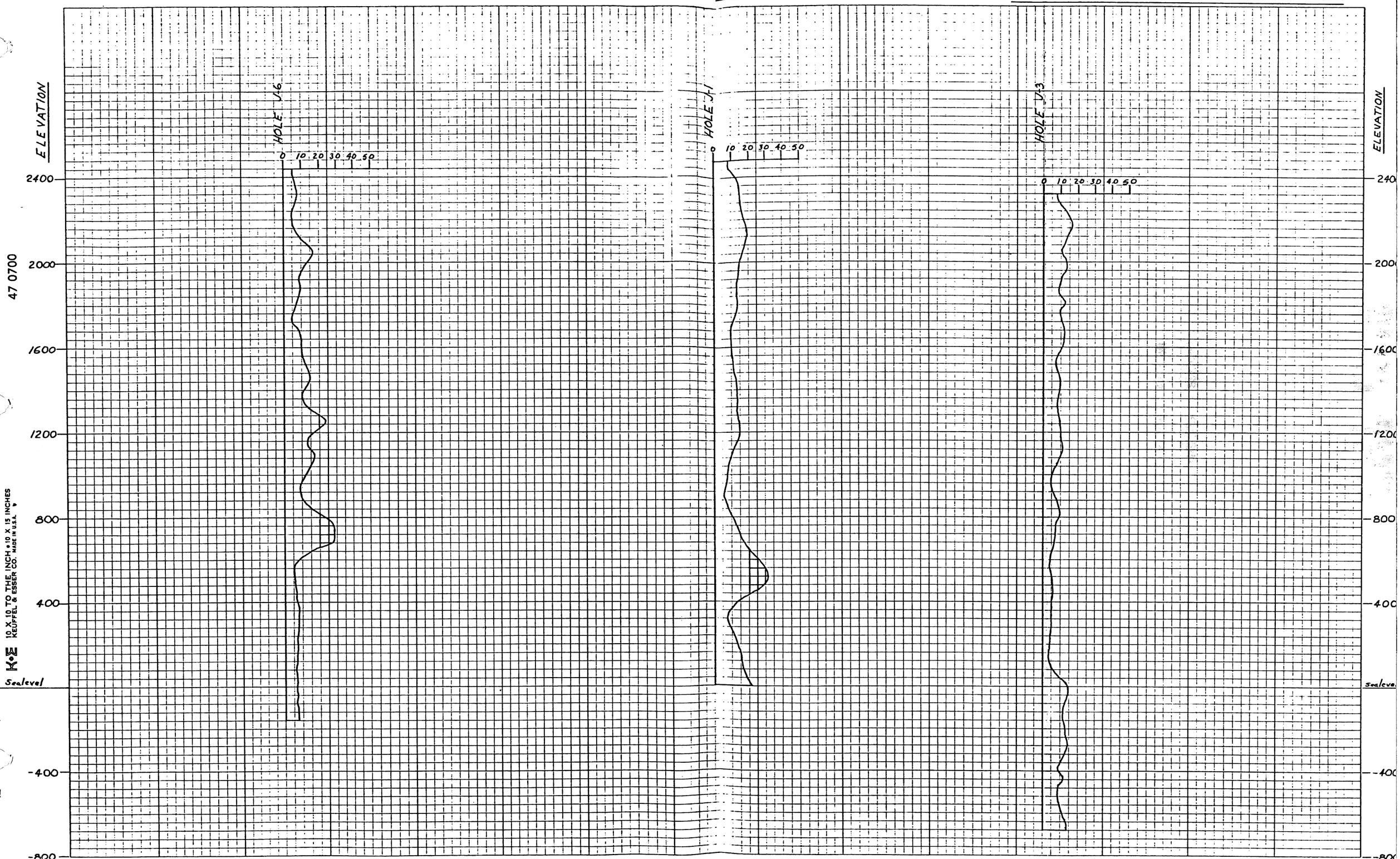
1" = 400'

CITIES SERVICE MINERALS CORP KELVIN PROJECT

VOL. % MAGNETITE



CITIES SERVICE MINERALS CORP. KELVIN PROJECT - CALCULATED CHARGEABILITY (Mc)



SECTION 20

GILA
SOUTHERN
PACIFIC
TRAIL
ARNOLD JOHNSON, ETAL
FEDERAL MINPAT. LODE CLAIMS
C.S.M.C. OPTION
Golden Bell Mine
A-Diamond Ranch
J-7
J-4
J-2
J-1
J-6
J-3
KM-6
ROIZ ETAL SIDEVIEW GROUP
C.S.M.C. OPTION
C.S.M.C. OPTION:
SHARP-HELMICK STATE PROSPECTING PERMIT
C.S.M.C. STATE PROSPECTING PERMIT
Spring
Radio Tower
Rattlesnake
WILLIAMS HOLE CAVE
NO PROFIT

SECTION 21

FILE NO.

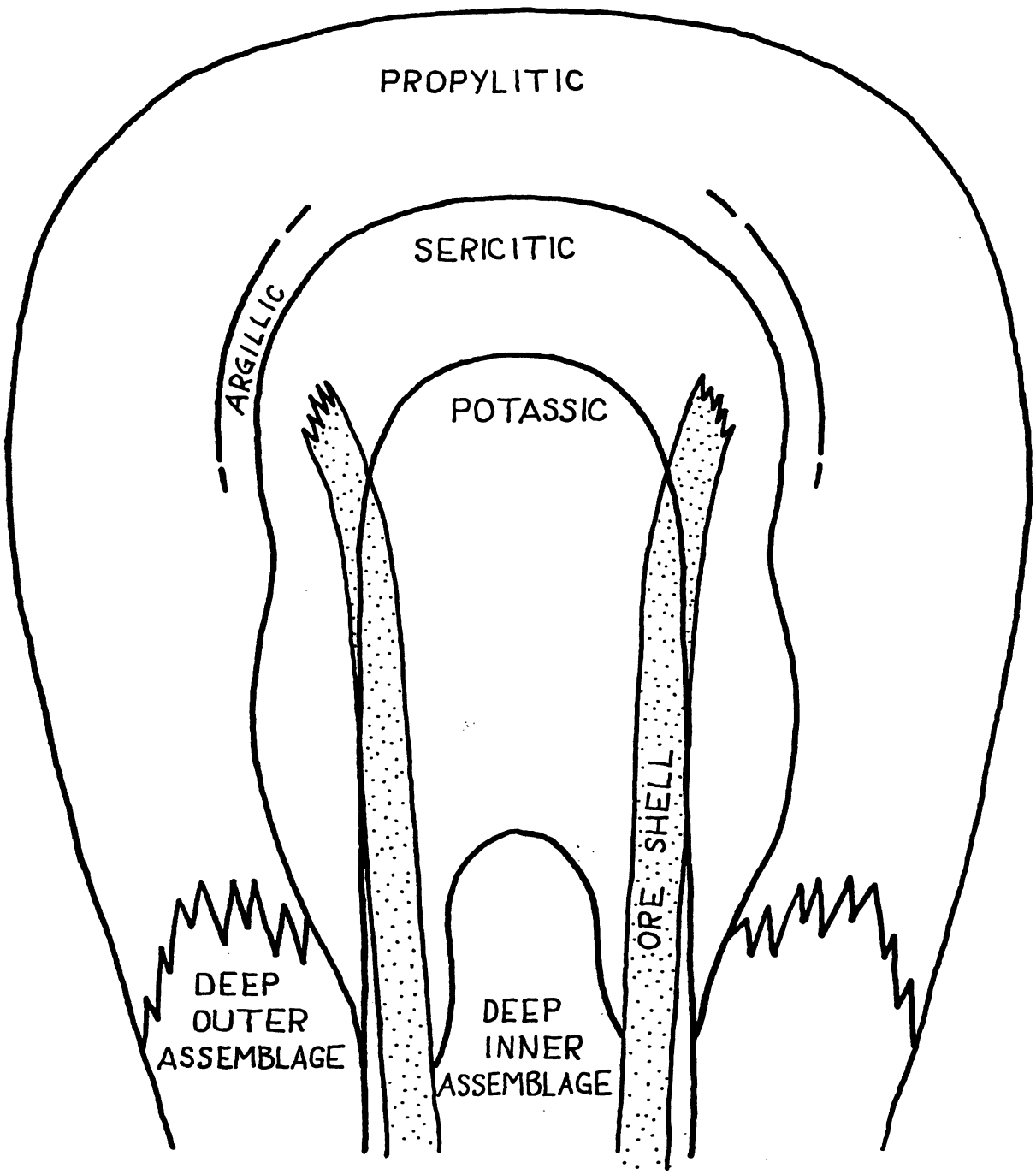
CITIES SERVICE MINERALS CORPORATION

SCALE None

DATE 6 June, 77

DRAWN BY C.H. Roe

LOWELL & GUILBERT MODEL



TITLE _____ SKETCH NO.

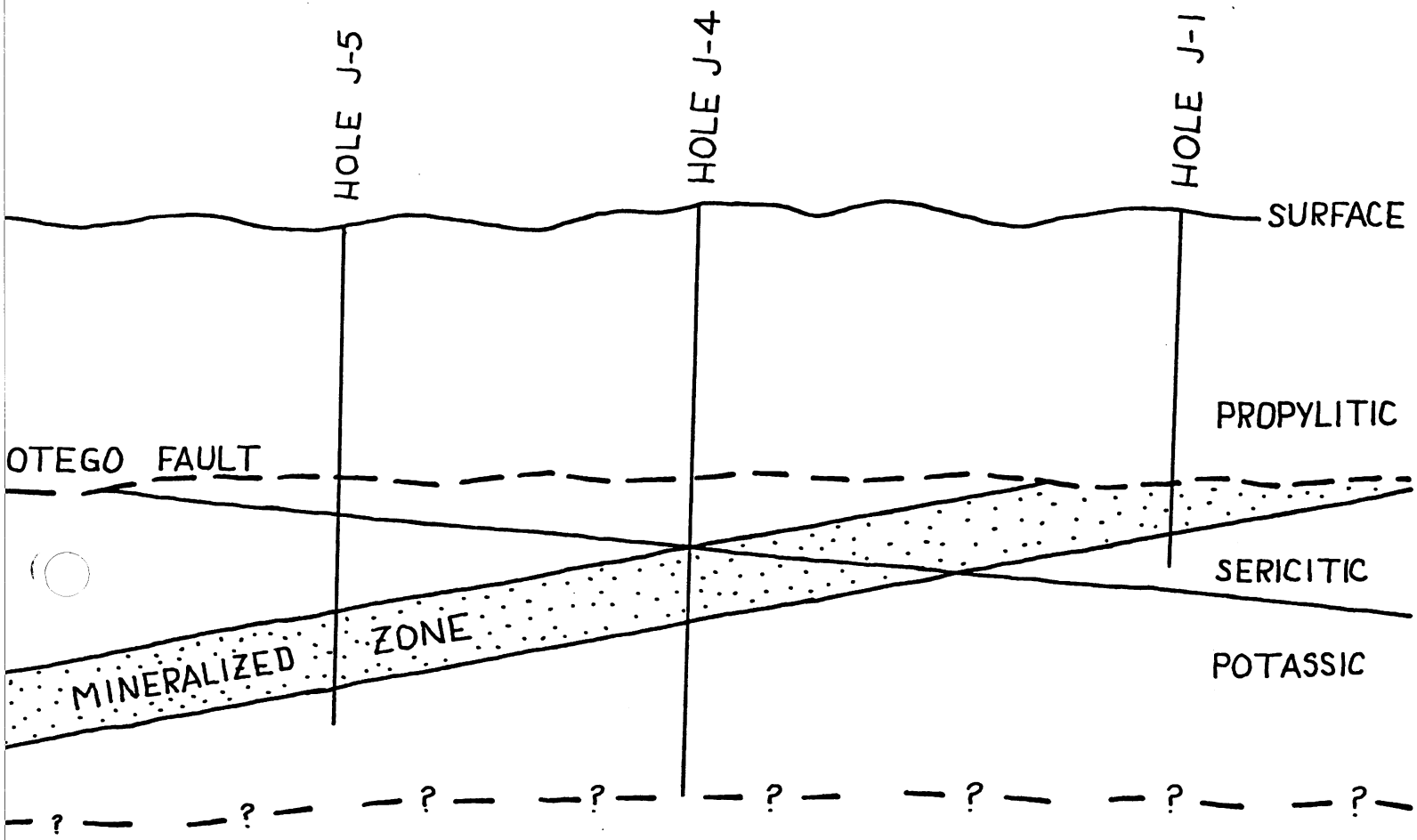
FILE NO.

CITIES SERVICE MINERALS CORPORATION

SCALE

DATE 6 June, 77

DRAWN BY C. H. Roe



TITLE

SKETCH NO. 2

SECTION 22

BY J.P.V. DATE 6/28/77 SUBJECT SUBSURFACE GEOLOGIC COLUMN - KELVIN PROJECT - PINAL CO., ARIZONA (HOLES J1 - J6). SHEET NO. 1 OF 1

CHKD. BY DATE JOB NO.

REC

Qal

Quaternary alluvium: unconsolidated medium-grained with fragments of Precambrian Oracle Granite, diabase, diorite and quartz

← Tertiary Dacite Porphyry

LARAMIDE

TKgp III

Tertiary-Cretaceous Granodiorite Porphyry III: a medium-gray rock with plagioclase phenocrysts up to 0.25 inch in a medium-grained (0.1 inch) groundmass of plagioclase, quartz, biotite, magnetite and interstitial K-spar. Chilled margins up to 20 feet are common (in which the slightly porphyritic texture is absent. Appears to cut Ttc in hole KE-1. The most equigranular of the Laramide porphyritic rocks.

TKgp II

Tertiary-Cretaceous Granodiorite Porphyry II: a medium to dark gray rock with 50 [redacted] percent phenocrysts of anhedral quartz up to 0.3 inch in diameter, subhedral plagioclase up to 0.4 inch in length and euhedral to subhedral biotite up to 0.1 inch in a medium grained groundmass of K-spar, quartz and biotite (some of which may be secondary). Magnetite = 0.27%. Much darker in appearance than Teacup Granodiorite (when both are fresh) although they may be closely related. The two units are clearly distinguished in hole KE-1. May be correlative with Rhyodacite Porphyry (Tr_2) of the U.S.G.S.

Ttc a

63 m.y.b.p.

Paleocene Teacup Granodiorite: a medium to light gray rock with 50 to 60 percent phenocrysts of (in order of decreasing abundance) plagioclase up to 0.3 inch in length, subhedral quartz up to 0.3 inch and biotite up to 0.2 inch in a fine to medium grained groundmass of quartz, K-spar (minor) plus plagioclase, biotite and possible hornblende. Magnetite = 0.18 - 0.23%. Ttca = aplitic facies (light gray in color).

TKMr

Tertiary-Cretaceous Melanocratic Rhyodacite Porphyry: approximately 20 percent phenocrysts of (in order of decreasing abundance) subhedral plagioclase up to 0.4 inch, rounded (embayed) quartz up to 0.1 inch with hornblende and/or biotite up to 0.1 inch in a matrix of the same minerals plus K-spar. Magnetite content (variable) averages 0.8 percent.

Kb

Cretaceous (?) Intrusive Breccia: angular to subrounded (subordinate) fragments of Precambrian Oracle and Diabase and Quartz, K-feldspar and Plagioclase in a matrix of angular fragments of quartz, K-feldspar, plagioclase, possible fine-grained clay and interstitial K-spar and pyrite. Crystals are not fractured. Matrix is generally dark gray to black. Contacts indicate a clear intruse emplacement for these rocks. Interpreted to be due to fluidization.

YOUNGER PRECAMBRIAN

Ydb

1140 m.y.b.p.

Younger Precambrian (?) Diabase: both fine-grained and coarse-grained varieties are present.

Yr a

1430 m.y.b.p.

Younger Precambrian Oracle (Ruin) Granite: porphyritic quartz monzonite with numerous pink, euhedral K-spar phenocrysts up to 1.5 inch in length; plagioclase crystals, generally euhedral up to 0.25 inch in diameter in a coarse-grained groundmass of quartz, K-spar, plagioclase, biotite and minor magnetite and hornblende.

OLDER PRECAMBRIAN

Yxmd

1630 m.y.b.p.

Younger-Older Precambrian Madera Diorite:

Xps

1700 m.y.b.p.

Older Precambrian Pinal Schist:

} at Kelvin seen only as inclusions in Younger Precambrian Oracle Granite.

SECTION 23