



Public Health Engineering Division  
541 Federal Public Building  
Edmonton, Alberta

December 9, 1966

ARSENIC CONCENTRATIONS IN WATER SUPPLIES

YELLOWKNIFE, N.W.T.

SEASONAL FLUCTUATION

There is a definite relationship between time of year and arsenic content in the water supplies, with the highest concentrations occurring in May, June and July. Some of this was attributed to processing of stored calcine, however the fact that there was a recurrence during the corresponding period of 1966 when this processing was not being carried out is indicative of the extent of the arsenic contamination of the runoff. In addition, the fluctuation of arsenic levels corresponds somewhat with summer precipitation. See Graph No. 9.

FLUCTUATION WITH TIME

Average monthly values have increased during May, June and July, the critical months since the results in 1961 at the Town and Con Mine Supply. May and June averages have increased at Giant Mine.

1966 RESULTS

The most intensive study to date was carried out in 1966, with weekly samples analyzed. The frequency with which the arsenic concentration exceeded the U.S.P.H.S. levels of 0.01 and 0.05 ppm., and the P.H.E. emergency level of 0.3 ppm. are illustrated in the following table.

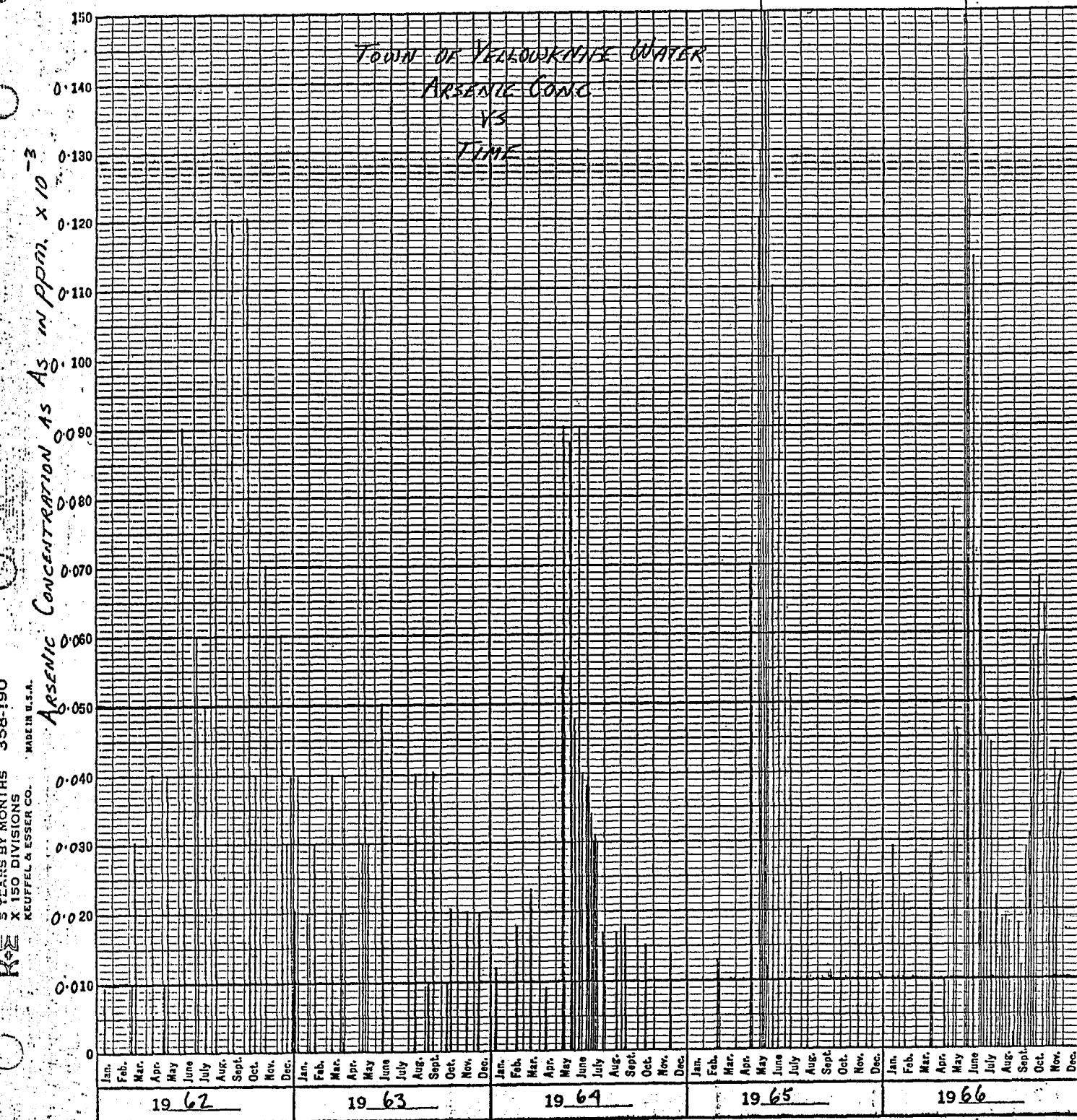
	<u>% Frequency &gt;0.01 ppm.</u>	<u>% Frequency &gt;0.05 ppm.</u>	<u>% Frequency &gt;0.3 ppm.</u>
Town Water	93	34	3
Giant Water	96	60	6
Con Water	83	30	1

COST OF PIPELINE FROM UPSTREAM - approximately \$650,000, including six mile pipeline to new source, new water treatment and heating building.

*J.W. Grainge*  
J.W. Grainge, P. Eng.  
Regional Engineer

G.R.A.P.H. #1

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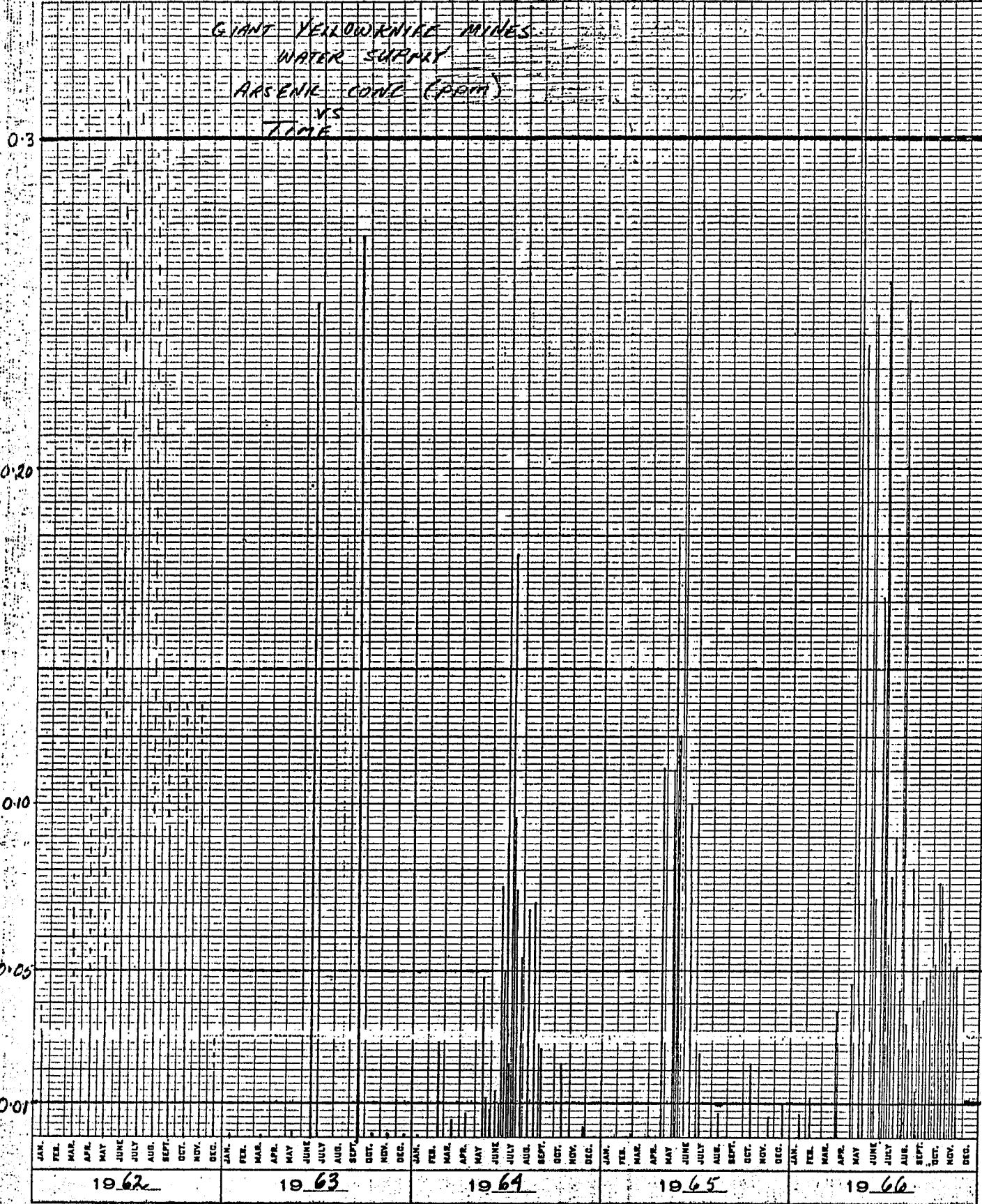
0.01 mg/litre - recommended limit - USPHS  
0.05 mg/litre - grounds for rejection

NO. 34-T33 DIETZGEN GRAPH PAPER

5 YEARS BY MONTHS

EUGENE DIETZGEN CO.  
MADE IN U.S.A.

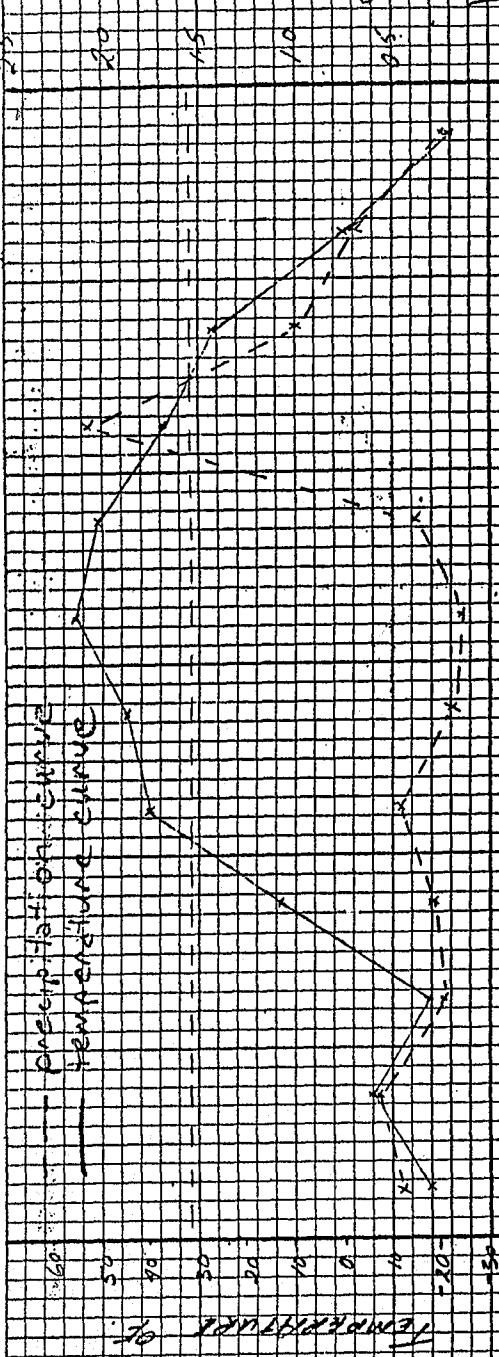
*Arsenic Concentration (ppm)*



0.01 mg / litre - recommended limit USPHS

0.05 mg / litre - grounds for rejection

0.3 mg / litre - emergency level



Period 14 Oct 1963

Temperature Change

in Degrees  
Refrigeration

CROP GROWING  
PERIODS BETWEEN  
GREENHOUSE CONC.  
REFRIGERATION

TEMPERATURE.

at VERDONTEA HUT

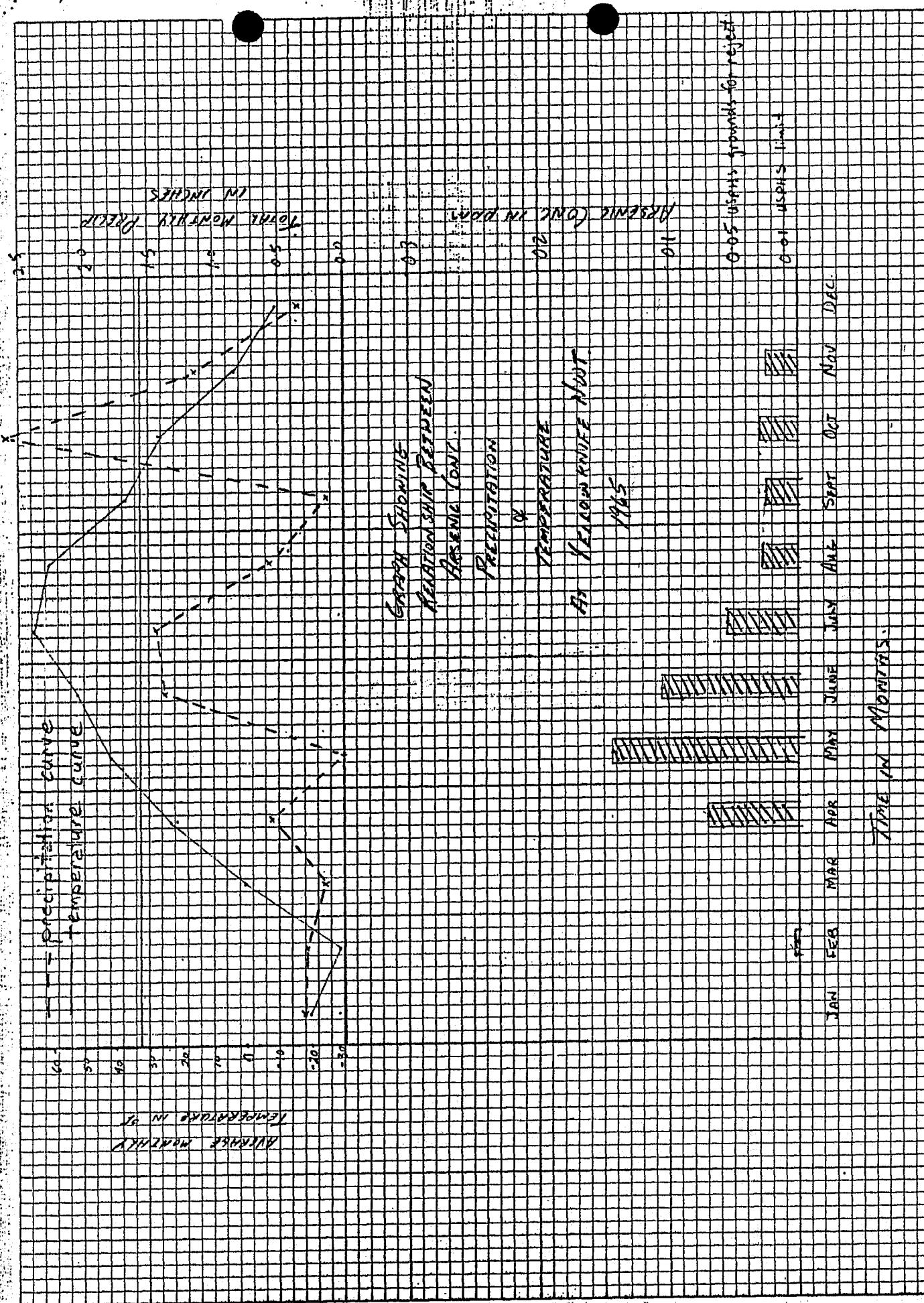
1963.

REFRIGERATION  
COOLING W/ W/

0.05

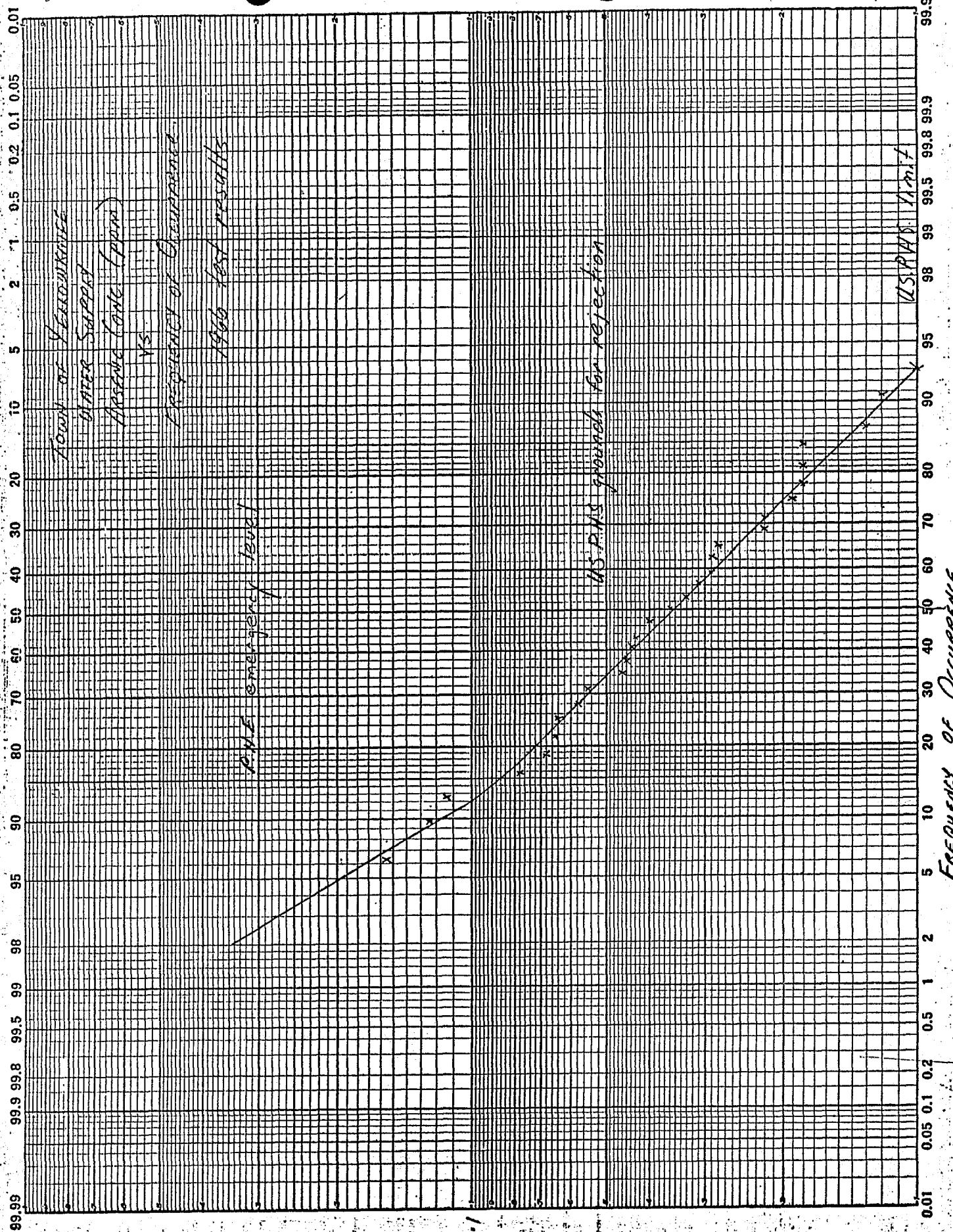
0.01

JUN JULY AUG SEPT OCT NOV DEC

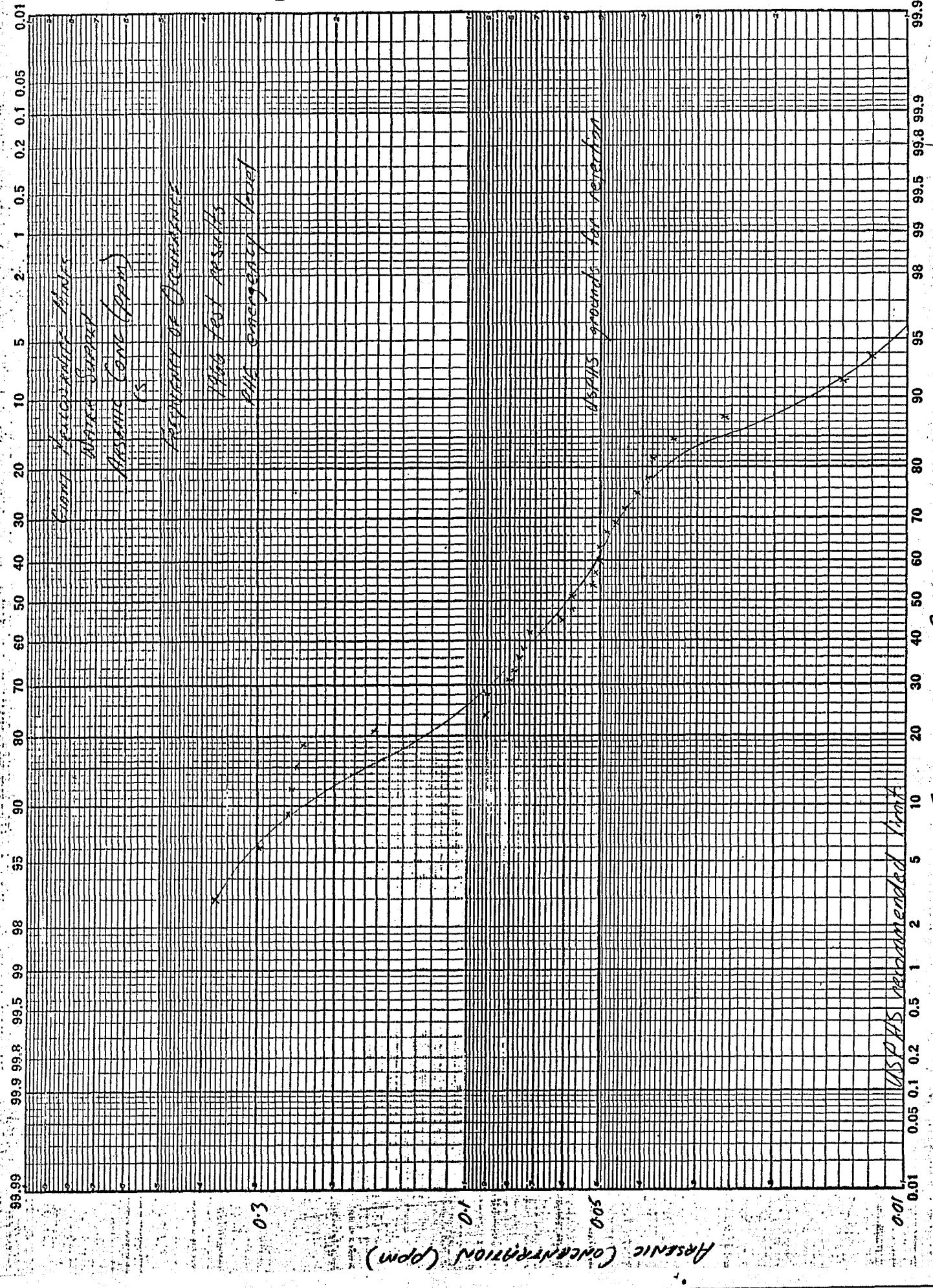


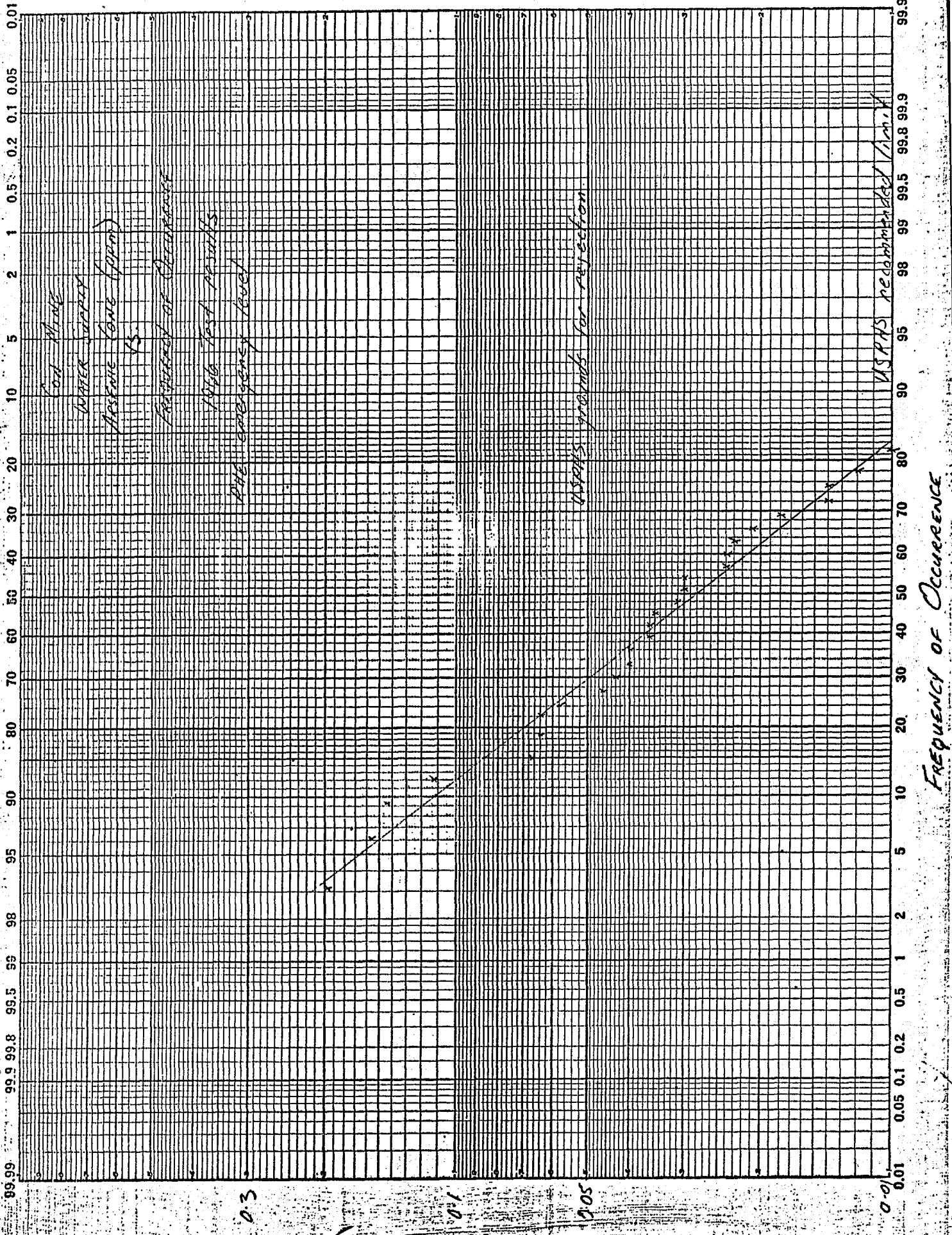
GRAPH #5

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ARSENIC CONCENTRATION (PPM)







99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 .5 0.2 0.1 0.05 0.01

100% 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 .5 0.2 0.1 0.05 0.01  
TANDEM 22' VERTICALLY  
HAZEN'S STAND.  
HAZEN & WHIPPLE ASSOCIATES, CHICAGO, ILLINOIS

0

ONE CROTONAL TOWER

AFFINEIN CONCENTRATION (ppm)

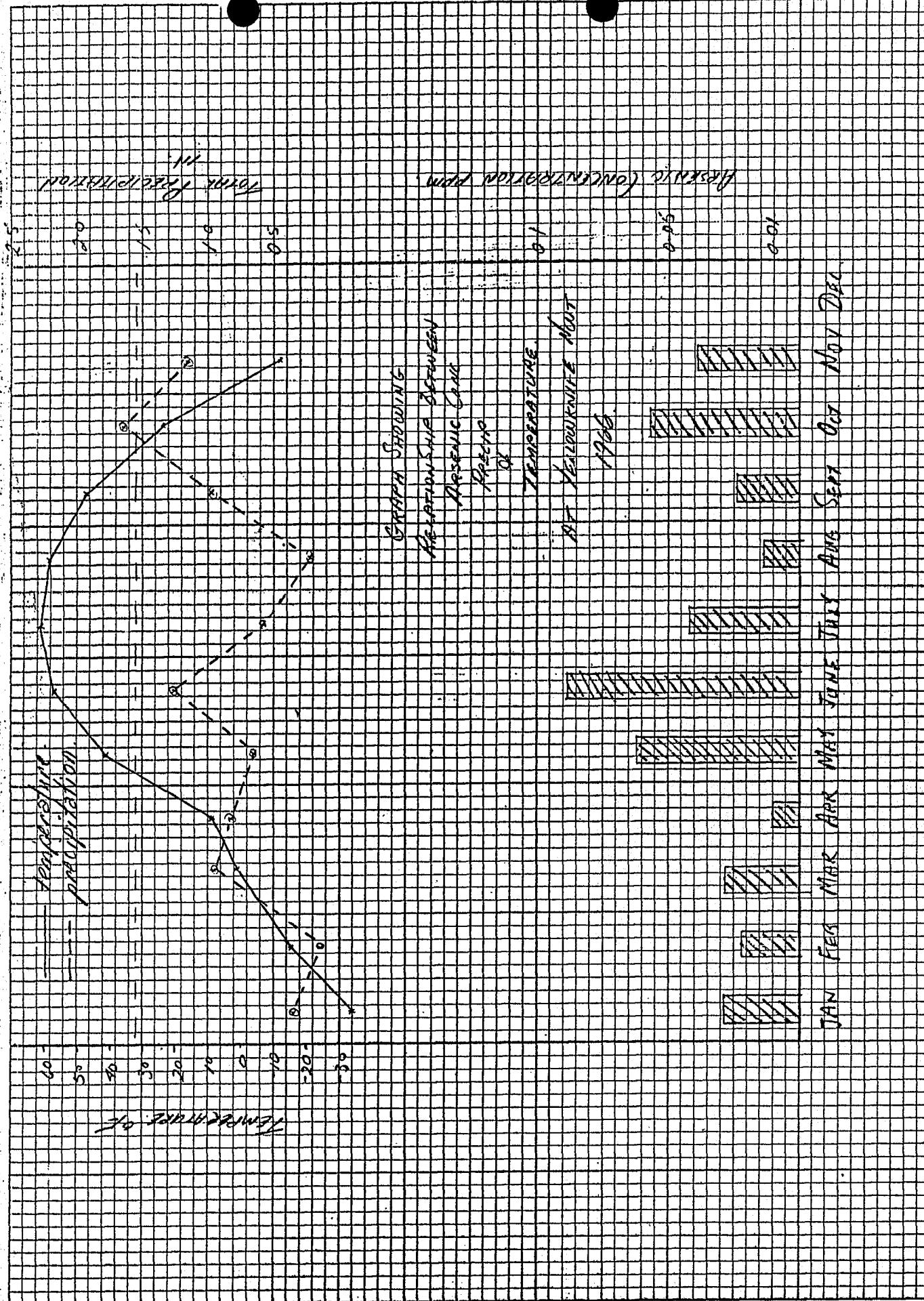
⑧ A 1% sugar content is 0.99 ppm.

8

1.5% sugar for rejection

0.02

0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99



TOWN OF YELLOWKNIFE

MONTHLY AVERAGE ARSENIC CONCENTRATIONS

<u>Month</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
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Town Supply

January	0.015	<0.01	0.03	0.012	-	0.029
February	0.02	-	0.03	0.018	0.013	0.022
March	0.02	0.02	0.03	0.023	-	0.028
April	0.02	0.04	0.04	0.009	0.070	0.010
May	0.04	0.025	0.07	0.077	0.143	0.062
June	0.04	0.09	0.05	0.051	0.105	0.089
July	0.03	0.055	-	0.027	0.054	0.042
August	0.02	0.12	0.04	0.017	0.029	0.014
September	0.02	0.12	0.025	0.018	0.025	0.024
October	-	0.08	<0.015	0.015	0.030	0.057
November	-	0.07	0.02	0.010	0.024	0.039
December	-	0.04	0.02			

Giant Mine

January	-	0.03	<0.01	<0.001	-	0.007
February	-	-	-	0.032	0.001	0.012
March	-	0.045	<0.01	0.005	-	0.038
April	<0.01	0.04	-	0.007	0.110	0.046
May	<0.018	0.0550	0.02	0.023	0.120	0.305
June	0.197	0.206	0.54	0.047	0.136	0.210
July	0.09	0.301	-	0.083	0.285	0.068
August	0.01	0.115	-	0.069	0.025	0.081
September	-	0.092	0.27	0.026	0.007	0.045
October	0.104	0.095	<0.015	0.022	0.027	0.067
November	0.077	0.116	0.01	0.003	0.006	0.054
December	0.032	<0.02	<0.01	-	0.010	-

Con Mine

January	0.015	<0.01	0.025	0.013	-	0.024
February	0.02	-	0.04	0.020	0.012	0.014
March	0.02	0.025	0.03	0.021	-	0.030
April	0.02	0.02	0.04	0.011	0.05	0.024
May	0.04	0.03	0.04	0.071	0.16	0.066
June	0.02	0.06	0.05	0.040	0.075	0.134
July	0.02	0.05	-	0.024	0.048	0.029
August	0.02	0.12	0.04	0.009	0.024	0.0090
September	0.03	0.07	0.02	0.011	-	0.016
October	-	0.045	<0.01	0.015	0.024	0.039
November	-	0.08	0.01	0.010	0.036	0.038
December	-	0.056	0.03	-	0.024	-

**ARSENIC RESULTS YELLOWNITE**

Date	Giant Tap	Con Tap	Town Tap	Tailings Pond	Baker Creek Mouth	Indian Village	Frame Lake	Latham Island	Firehall	Yell. Bridge	Long Lake	Kam Lake
<b>1964</b>												
Jan. 10	<0.001	0.013	0.012									
Feb. 20	0.032	0.020	0.018									
Mar. 18	0.005	0.021	0.023									
Apr. 13	0.007	0.011	0.009									
May 18	0.008	0.036	0.054	17.100	2.720	1.700	0.272					
May 21	0.012	0.098	0.090	18.800	1.300	0.218						
May 29	0.008	0.080	0.088	21.400	0.820	0.198						
June 9	0.014	0.058	0.048	23.800	2.475	0.550						
June 16	0.010	0.027	0.090	25.200	2.760	0.300						
June 24	0.075	0.010	0.010	50.000	3.080	0.160						
June 29	0.050	0.040	0.038									
June 30	0.088	0.038	0.038									
July 2	0.022	0.032	0.034									
July 13	0.030	0.026	0.021									
July 10	0.174	0.030	0.030									
July 13	0.096	0.026	0.031	39.000	4.160	0.161						
July 16	0.074	0.020	0.030	28.600	3.400	0.140						
July 27									0.188			
July 28	0.054	0.011	0.017	34.000	6.720	0.128						
July 23									0.480			
Aug. 10	0.068	0.011		31.200	1.250	0.106						
Aug. 25	0.070		0.017	30.800								
Aug. 20		0.008							4.520	0.074		
Sept. 3	0.026	0.011	0.018	31.600					0.162			
Oct. 15	0.022	0.015	0.015						7.000			
Nov. 30	0.003	0.010	0.014									
<b>1965</b>												
Feb. 26		0.001	0.012	0.013								
Apr. 26		0.110	0.050	0.070						2.12		
May 26		0.120	0.120	0.120								
May 19		0.180	0.140	0.130	32.00						0.250	
												0.17
												>0.01

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(cont.)

Date	Giant Tap	Con Tap	Town Tap	Tailings Pond	Baker Creek Mouth	Latham Village Lake	Frame Lake	Firehall Island	Yell. Bridge	Long Lake	Kam Lake
May 17	0.110	0.160	0.170								
May 21	0.120	0.190	0.150								
June 9	0.470	0.100	0.110								
June 23	0.100	0.0500	0.10								
July 9	0.025	0.018	0.054	37.500	14.300	6.60	0.17	0.09	0.14	0.16	
Aug. 10	0.007	0.024	0.029			6.60	0.16				
Oct. 12	0.022	0.024	0.025								
Nov. 22	0.006	0.036	0.030								
Dec. 10	0.010	0.024	0.024								
<hr/>											
<b>1966</b>											
Jan. 17	0.007	0.024	0.029								
Feb. 8	0.012	0.014	0.022								
Mar. 29	0.038	0.030	0.028								
Apr. 25	0.046	0.024	0.010								
May 10	0.372	0.647	0.078								
May 16	0.237	0.667	0.06								
June 2	0.246	0.144	0.156	31.60	1.025	1.025	0.037	0.037	0.037	0.037	
June 6	0.091	0.198	0.123	34.05	3.310	0.663	0.189	0.189	0.189	0.189	
June 20	0.161	0.157	2.910		0.702	0.625	0.202	0.202	0.202	0.202	
June 27	0.294	0.111	0.114	57.75	0.340	0.018	0.157	0.157	0.157	0.157	
July 4	0.256	0.059	0.065	40.00	3.125	0.022	0.072	0.072	0.072	0.072	
July 11	0.058	0.035	0.055	45.375	0.340	0.018	0.111	0.111	0.111	0.111	
July 18	0.073	0.036	0.045	58.000	3.250	0.165	0.055	0.055	0.055	0.055	
July 22	0.090	0.036	0.044	56.000	4.330	0.150	0.050	0.050	0.050	0.050	
July 29	0.044	0.009	0.022	48.000	4.850	0.188	0.024	0.024	0.024	0.024	
Aug. 1	0.250	0.012	0.013	48.500	3.100	0.255	0.006	0.006	0.006	0.006	
Aug. 8	0.034	0.008	0.018	38.000	7.450	0.010	0.004	0.004	0.004	0.004	
Aug. 15	0.026	0.010	0.019	46.480	10.880	0.110	0.005	0.005	0.005	0.005	
Aug. 24	0.080	0.009	0.018	36.500	8.550	0.110	0.004	0.004	0.004	0.004	
Aug. 29	0.014	0.007	0.002	52.000	2.000	0.175	0.002	0.002	0.002	0.002	
Sept. 6	0.039	0.014	0.018	50.000	5.125	0.150	0.005	0.005	0.005	0.005	

(cont.)

Date	Giant Tap	Con Tap	Town Tap	Tailings Pond	Baker Creek Mouth	Baker Creek Above Tails.	Indian Village Lake	Frame Island	Latham Giant	Above Intake	Below Mill Waste	Below Mill No. 3	Below Mine No. 4	Waste
Sept. 12	0.041	0.006	0.012	37.500	12.500	0.270	0.012			0.028	0.029			
Sept. 19	0.048	0.020	0.029	58.000	12.400	0.200				0.038	0.048			
Sept. 26	0.050	0.023	0.031	47.500	5.50	0.068				0.040	0.054	15.80	36.0	0.72 5150.0
Oct. 3	0.052	0.018	0.036	47.000	1.750	0.183	0.006			0.048	0.064	22.4	4.50	
Oct. 11	0.076	0.064	0.058	42.500	14.250		0.009			2.400	0.070	23.80	0.60	4.8
Oct. 17	0.075	0.046		39.500	13.800		0.124			0.070				
Oct. 18	0.072	0.030	0.068			15.900				2.400				
Oct. 24	0.058	0.040	0.064	46.000										
Nov. 1	0.061	0.031	0.033											
Nov. 10	0.050	0.043	0.043											
Nov. 14	0.051	0.040												