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ADDENDUM

by C. J. Touhill

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AN EVALUATION OF HANFORD WATER TREATMENT PRACTICES
ADDENDUM

by

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AN EVALUATION OF HANFORD WATER TREATMENT PRACTICES
ADDENDUM

This is an addendum to the unclassified document entitled, "An Evaluation of Hanford Water Treatment Practices." All classified data pertinent to the above document have been included here for reference.

TABLE A-1

CHLORINE DEMAND DATA - 1964

Chlorine Residual (ppm)										Chlorine Demand (ppm)						
(2)										(3) (1) - (2)						
B	C	D	DR	F	H	KE	KW	B	C	D	DR	F	H	KE	KW	
0.05	0.05	0.05	0.05	0.05	0.13	0.19	0.05	0.35	0.35	0.07	0.06	0.36	0.65	0.39	0.42	
0.05	0.05	0.05	0.05	0.05	0.07	0.20	0.05	0.35	0.35	0.06	0.06	0.31	0.11	0.21	0.26	
0.05	0.05	0.05	0.05	T	0.05	0.19	0.20	0.35	0.35	0.15	0.13	0.14	0.38	0.40	0.47	
0.05	0.05	0.05	0.05	T	0.05	0.16	0.18	0.25	0.35	0.26	0.33	0.25	0.57	0.58	0.66	
0.05	0.05	0.05	0.05	T	0.08	0.20	0.22	0.25	0.35	0.36	0.43	0.59	0.82	0.72	0.83	
0.05	0.05	0.05	0.05	T	0.12	0.18	0.20	0.35	0.65	1.24	1.02	0.69	1.08	0.92	1.01	
0.05	0.05	0.05	0.05	T	0.16	0.33	0.20	0.65	0.55	0.85	0.96	0.83	0.79	0.67	1.00	
0.05	0.05	0.05	0.05	T	0.16	0.21	0.23	0.55	0.35	0.81	1.29	0.78	0.88	0.75	0.92	
0.05	0.05	0.05	0.05	T	0.13	0.20	0.20	0.35	0.35	0.75	0.64	0.59	0.92	0.71	0.81	
0.05	0.05	0.05	0.05	T	0.10	0.19	0.21	0	0	0.44	0.65	0.37	0.59	0.59	0.68	
0.05	-	0.075	0.075	0.075	0.05	0.18	0.15	0.30	0.54	0.33	-	0.13	0.38	0.38	0.50	
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.26	0.37	0.40	0.60	0.11	0.40	0.34	0.33	

TABLE A-II

CHLORINE CONTACT TIMES

<u>Area</u>	<u>Approximate Contact Time (min)</u>
B	10
C	25
D	10
DR	25
F	10
H	10
KE	30
KW	30

CALCULATION OF FLOCCULATION

INDICES - G and Gt

<u>Area</u>	<u>Flocculator Capacity (gal.)</u>	<u>Retention time (min.)</u>
B	65,000	0.68
C	278,000	2.32
D	65,000	0.58
DR	173,000	2.28
F	65,000	0.70
H	93,000	0.94
KE	390,000	1.74
KW	390,000	1.74

C Water Treatment Plant

$$V = 37,044 \text{ ft}^3$$

$$C_D = 1.8$$

$$v = 1.64 \times 10^{-5} \text{ ft}^2/\text{sec at } 5^\circ\text{C}$$

$$v = 1.09 \times 10^{-5} \text{ ft}^2/\text{sec at } 20^\circ\text{C}$$

$$v = \frac{2\pi r n}{60} = \frac{2\pi(7.5)(2)}{60} = 1.57 \text{ ft/sec}$$

$$A = 254 \text{ ft}^2$$

$$G = \sqrt{\frac{C_D A v^3}{2 V v}} = \sqrt{\frac{(1.8)(254)(1.57)^3}{2 (1.64 \times 10^{-5}) (37,044)}}$$

$$G \text{ at } 5^\circ\text{C} = 38.1 \frac{\text{ft/sec}}{\text{ft}}$$

$$G \text{ at } 20^\circ\text{C} = 46.9 \frac{\text{ft/sec}}{\text{ft}}$$

$$Gt \text{ at } 5^\circ\text{C} = 5300$$

$$Gt \text{ at } 20^\circ\text{C} = 6530$$

B Water Treatment Plant

$$V = 8500 \text{ ft}^3$$

$$C_D = 1.8$$

(same v values)

$$v = \frac{2\pi r n}{60} = \frac{2\pi(4)(4)}{60} = 1.68 \text{ ft/sec}$$

$$A = 160 \text{ ft}^2$$

$$G = \frac{\sqrt{(1.8(160)(1.68)^3)}}{2(1.64 \times 10^{-5})(0.85 \times 10^4)}$$

$$G \text{ at } 5^\circ\text{C} = 70 \frac{\text{ft/sec}}{\text{ft}}$$

$$G \text{ at } 20^\circ\text{C} = 84.5 \frac{\text{ft/sec}}{\text{ft}}$$

$$Gt \text{ at } 5^\circ\text{C} = 2860$$

$$Gt \text{ at } 20^\circ\text{C} = 3460$$

TABLE A-III
FLOW VELOCITY IN FLOCCULATION BASINS

<u>Reactor Area</u>	<u>Flow Rate (ft³/sec)</u>	<u>Area (ft²)</u>	<u>Flow Velocity (ft/sec)</u>
B	212	387	0.55
C	268	756	0.35
D	250	387	0.65
F	207	387	0.54
H	221	387	0.57
KE	500	880	0.57
DW	500	880	0.57

*Note: Floc particles will settle below velocity of 0.5 ft/sec. Thus, most plants will not have complete deposition, but will have measurable accumulations if the flocculators are inoperative.

TABLE A-IV
OVERFLOW VELOCITIES AND PARTICLE REMOVAL
EFFICIENCY

<u>Reactor</u> <u>Area</u>	<u>Overflow Velocity</u> <u>(Q/A) (gal/min)</u> ft ²	<u>Particle Removal (y/yo)</u>	
		<u>@ 5°C (%)</u>	<u>@ 20°C (%)</u>
B	19.6	5.5	7.4
C	6.4	16.7	22.7
D	23.0	4.7	6.3
DR	6.3	17.0	23.2
F	19.1	5.6	7.6
H	18.7	5.7	7.8
KE	4.5	23.6	32.2
KW	4.5	23.6	32.2

*These calculations are based on ideal settling conditions with no short-circuiting.

TABLE A-V

FILTRATION FLOW RATES

<u>Reactor Area</u>	<u>Filter Flow Rates (gpm/ft²)</u>
B	6.9
C	4.3
D	6.1
DR	6.6
F	6.7
H	5.4
KE	7.4
KW	7.4

TABLE A-VI

BACKWASH FLOW RATES

<u>Reactor Area</u>	<u>Backwash Rate (gpm/ft²)</u>
B	18.2
C	17.2
D	13.5
F	13.0
H	14.8
KE	15.6
KW	15.6

END

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