11-1960

Special Report (1960)

Walter A. Lawrance
Bates College

Summary

1. At North Turner Bridge the average daily five day B.O.D. load for a ten week period was 42.3 tons. The daily average dissolved oxygen was 32.8 tons.

2. The river water leaving the Androscoggin Pool at Gulf Island Dam daily averages were five day B.O.D., 18.7 tons and dissolved oxygen 2.18 tons.

3. Reaeration probably provided about twenty-five tons of oxygen per day.

4. Two methods of calculation, admittedly inadequate, gave the Benthal daily contribution of thirty-two tons and twenty tons of B.O.D. respectively.

5. Omitting all reaeration, there appears an average daily difference of about seven tons of five day B.O.D. which did not currently pass North Turner Bridge.

Special Studies

1960

Introduction. For many years Benthal deposits in the Androscoggin Pool have produced one of the most difficult situations in the pollution of the Androscoggin River. Over a long period of time the Administrator had planned to obtain an estimate of the contribution to the oxygen demand originating in the Benthal and diffusing into the water layers above. This year a limited amount of time was available for some work in the Pool area.

The problem is a difficult one due to many variables, to mention a few,

1. Rate of microbial activity varies in different areas
2. The 'stirring' effect due to liberation of gases is very variable.
3. Rate of flow over the Benthal ranges from almost zero to many feet per second.
4. "Draw-down" operations at the Dam create fluctuations in depth.
5. Turn-over and mexes are complex.

There are available several complex mathematical procedures which could be applied to this problem but they require data which are not available and which would involve much time and expense. Even with these data certain assumptions would have to be made the validity of which would render the final conclusions somewhat doubtful.

A preliminary attack on this problem was devised so as to obtain data which might indicate the approximate magnitude

of the daily production of Benthol B.O.D. which diffuses into the water. The final data appear to have a probable order of magnitude.

Procedure. Daily determinations of five day, 20°C. B.O.D., D.O., and O.C.P. were made with river water sampled at North Turner Bridge and Gulf Island Dam. These results were adjusted for an average nine day time of passage through the Pool, and correlated with the daily flows. Tons of five day B.O.D. and Oxygen entering the Pool were compared with Tons of B.O.D. and Oxygen leaving the Pool nine days later. For each unit of oxygen decrease there should be a decrease of one unit of B.O.D. Should more oxygen disappear than B.O.D. then the difference could be due to pick-up from the Benthal.

Results. The analytical results are listed in Tables B.O.D.#2, B.O.D.-D.O.#1 and #2. Three bases have been chosen for reporting an explanation of these data, both are corrected for an average nine day time of passage.

1. No allowance for any reaeration between North Turner and Gulf Island Dam.
2. An arbitrary, but probable allowance for reaeration between the sampling stations.
3. Calculations using a percentage basis of ultimate B.O.D.

All the necessary tests were made daily except Sunday, for a period of thirteen weeks, June thirteen to September twenty-two.

Table B.O.D. #2

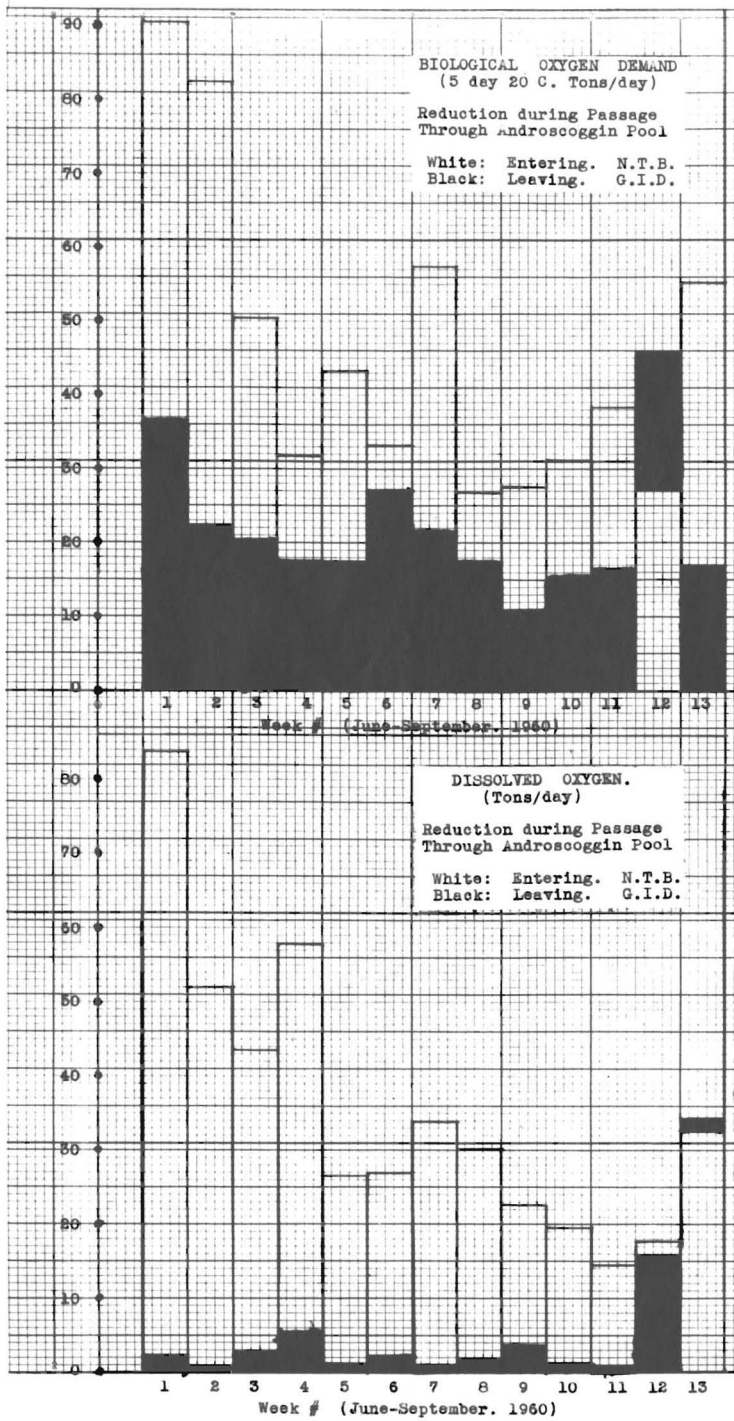
Biological Oxygen Demand
ppm Five Day 20°C

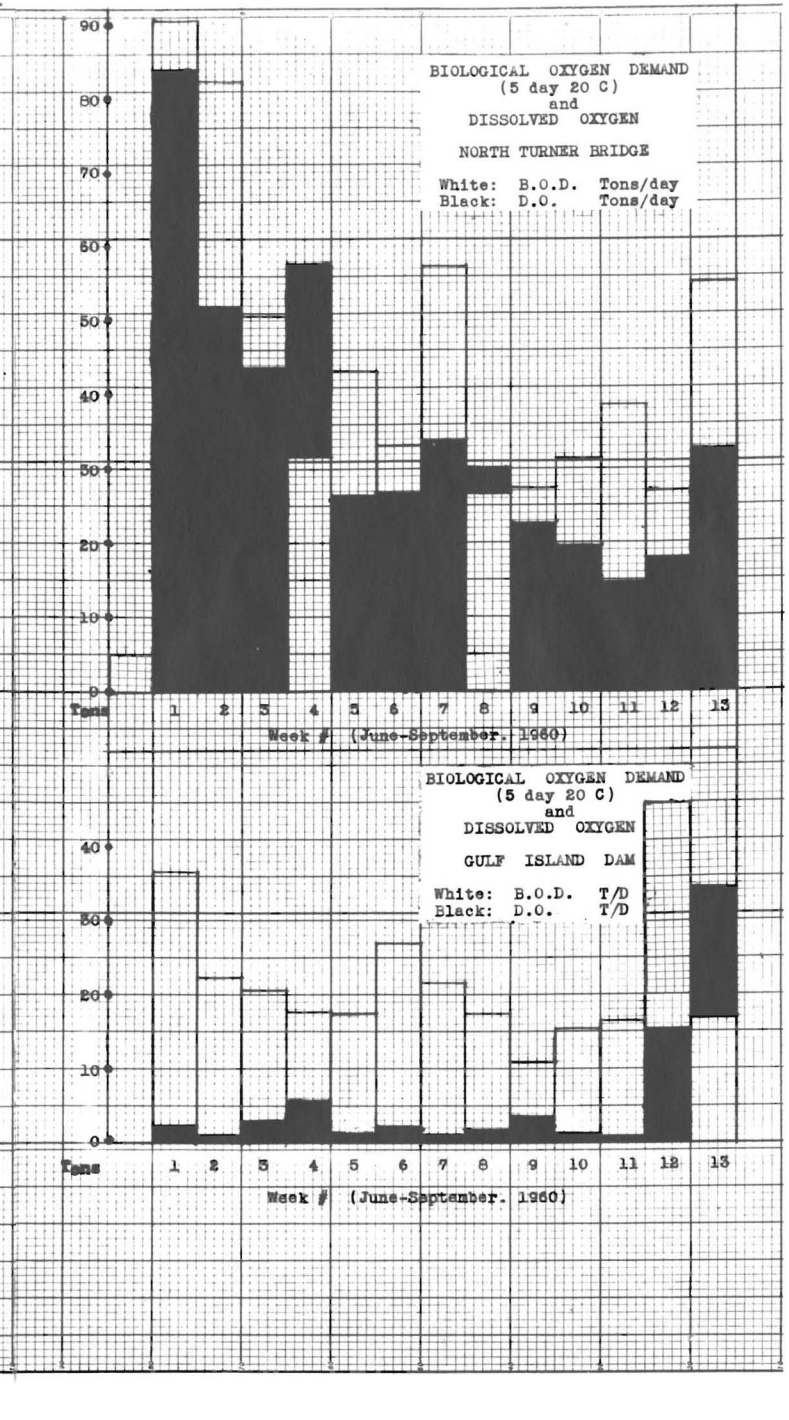
Date	N.T.B.	Date	G.I.D.
June 15	7.60	June 24	1.69
16	5.77	25	3.76
17	6.36	27	3.39
18	5.26	28	3.70
20	5.79	29	4.33
21	7.45	30	2.08
22	8.49	July 1	3.56
23	7.10	2	1.42
24	7.14	5	2.20
25	10.05	6	1.22
27	6.39	7	3.18
28	4.99	8	2.75
29	2.36	9	3.72
30	5.12	11	2.07
July 1	5.20	12	2.17
2	5.97	13	2.22
5	5.60	14	1.32
6	2.32	15	2.37
7	3.15	16	1.88
8	3.15	18	2.08
9	4.48	19	2.01
11	3.19	20	2.92
12	4.47	21	2.81
13	5.46	22	3.80
14	4.85	23	2.90
15	6.41	25	1.90
16	5.81	26	2.14
18	5.84	27	1.89
19	5.31	28	2.50
20	3.55	29	2.13
21	4.11	30	2.23
22	3.22	August 1	2.47
23	4.26	2	4.38
25	4.20	3	3.56
26	8.90	4	3.36
27	8.01	5	3.70
28	7.20	6	3.64
29	7.24	8	3.22
30	5.11	9	2,96
August 1	7.28	10	2.20
2	3.72	11	2.16
3	2.25	12	3.08
4	3.25	13	3.75
5	3.20	15	2.82

Table B.O.D. #2 cont.

Biological Oxygen Demand
ppm Five Day 20°C

Date		N.T.B.	Date		G.I.D.
August	6	4.07	August	16	2.20
	8	3.94		17	2.40
	9	5.26		18	1.30
	10	3.15		19	2.18
	11	2.62		20	1.75
	12	4.69		22	1.80
	13	5.11		23	1.52
	15	3.63		24	1.44
	16	5.52		25	1.03
	17	2.88		26	1.97
	18	2.65		27	2.10
	19	3.90		29	2.70
	20	3.78		30	2.21
	22	5.42		31	2.27
	23	9.21	September	1	3.73
	24	5.93		2	2.76
	25	4.25		3	2.66
	26	7.36		5	2.24
	27	5.78		6	2.93
	29	6.21		7	2.94
	30	6.21		8	4.34
	31	5.91		9	4.78
September	1	3.44		10	2.42
	2	4.61		12	2.96
	3	4.06		13	2.44
	5	6.55		14	2.68
	6	3.84		15	2.67
	7	8.03		16	2.37
	8	3.65		17	1.99
	9	4.41		19	2.26
	10	4.08		20	1.80
	12	4.65		21	1.66
	13	6.38		22	1.45


BIOLOGICAL OXYGEN DEMAND
(5 day 20 C. Tons/day)
Reduction during Passage
Through Androscoggin Pool
White: Entering. N.T.B.
Black: Leaving. G.I.D.
Week # (June-September. 1960)


BIOLOGICAL OXYGEN DEMAND
(5 day 20 C)
and
DISSOLVED OXYGEN
NORTH TURNER BRIDGE
White: B.O.D. Tons/day
Black: D.O. Tons/day
Tons
Week # (June-September. 1960)

DISSOLVED OXYGEN.
(Tons/day)
Reduction during Passage
Through Androscoggin Pool
White: Entering. N.T.B.
Black: Leaving. G.I.D.
Week # (June-September. 1960)

BIOLOGICAL OXYGEN DEMAND
(5 day 20 C)
and
DISSOLVED OXYGEN
GULF ISLAND DAM
White: B.O.D. T/D
Black: D.O. T/D
Tons
Week # (June-September. 1960)

For the purpose of calculation, the first week's data were excluded because a part of the week was pre-control pollution. Weeks #12 and #13 also were excluded due to abnormal conditions produced indirectly by hurricane Donna. In order to include Sundays in the calculations, the Saturday and Monday analytical results were added and divided by two. This procedure appears necessary because water passing by North Turner Bridge on Sunday leaves the Pool about nine days later.

At North Turner there were only two weeks when the amount of dissolved oxygen was more than sufficient to meet the five day B.O.D. demands. When the water left the Pool there was always an oxygen deficiency to meet the biological needs; week thirteen is an exception due to very abnormal conditions.

During the ten week period the average daily five day B.O.D. load entering the Pool was 42.3 tons and that leaving was 18.7 tons; a daily loss of 23.5 tons. Simultaneously the average dissolved oxygen available was 32.8 tons per day at North Turner and 2.18 tons remained in the water as it passed Gulf Island Dam; a daily loss of 30.6 tons. Making no allowance for reaeration there was a daily B.O.D. loss of 23.5 tons and an oxygen loss of 30.6 tons, this would indicate a gain in five day B.O.D. of about seven tons per day from the Benthal.

When reaeration is considered many problems arise due to several variables of flow, depth, temperature gradients and number of 'mixes'. In addition to these, the reaeration

Table D.O.-B.O.D. #1

NORTH TURNER BRIDGE

Dissolved Oxygen - Biological Oxygen Demand

Date	FLOW MT/d	DISSOLVED OXYGEN ppm	T/d	Wk avg	B.O.D. 5 day 20°C ppm	T/d	Wk avg
June							
15	9.96	4.40	43.8		7.60	75.7	
16	17.5	5.85	102.		5.77	101.	
17	22.8	6.76	154.		6.36	145.	
18	16.2	6.00	97.2		5.26	85.2	
19*	13.9	5.65	78.5		5.53	76.9	
20	12.7	5.30	67.3		5.79	73.5	
21	10.4	4.29	44.6	83.9	7.45	77.5	90.6
22	8.70	4.14	36.0		8.49	73.9	
23	8.67	4.65	40.3		7.10	61.6	
24	8.40	3.65	30.7		7.14	59.9	
25	10.8	5.26	56.8		10.05	109.	
26*	15.6	5.34	83.3		8.22	128.	
27	14.2	5.59	79.4		6.39	90.7	
28	10.9	5.30	57.8	52.0	4.99	54.4	82.5
29	9.18	4.39	40.3		2.36	21.7	
30	8.83	5.00	44.2		5.12	45.2	
July							
1	8.99	3.24	29.1		5.20	46.7	
2	10.2	3.40	34.7		5.97	60.9	
3*	9.18	4.48	41.1		5.79	53.2	
4	9.88	4.48	44.3		5.79	53.2	
5	13.1	5.56	72.8	43.8	5.60	73.4	50.6
6	11.8	6.80	80.2		2.32	27.4	
7	10.3	7.35	75.7		3.15	32.4	
8	9.34	6.24	58.3		3.15	29.4	
9	8.32	6.20	51.6		4.48	37.3	
10*	7.83	5.87	46.0		3.84	30.1	
11	9.21	5.54	51.0		3.19	29.4	
12	8.18	5.10	41.7	57.8	4.47	36.6	31.8
13	7.59	3.30	25.0		5.46	41.4	
14	8.26	3.20	26.4		4.85	40.1	
15	7.70	3.12	24.0		6.41	49.4	
16	7.43	3.44	25.6		5.81	43.2	
17*	7.32	3.65	26.7		5.83	42.7	
18	7.34	3.85	28.3		5.84	42.9	
19	8.07	3.85	31.1	26.7	5.31	42.9	43.2
20	7.78	3.90	30.3		3.55	27.7	
21	8.32	4.20	34.9		4.11	34.2	
22	7.34	4.22	30.9		3.22	23.6	
23	7.53	4.00	30.1		4.26	32.1	
24*	6.53	3.63	23.7		4.23	27.6	
25	6.94	3.26	22.6		4.20	29.1	
26	6.53	2.40	15.7	26.9	8.90	58.1	33.2
27	7.21	2.42	17.4		8.01	57.8	
28	6.64	2.43	16.1		7.20	47.8	
29	7.02	2.06	14.5		7.24	50.8	
30	7.53	2.32	17.5		5.11	41.5	
31*	9.40	3.86	36.3		6.20	58.3	

*Sunday calculated: Saturday plus Monday divided by two.

Table D.O.-B.O.D. #1 cont.

NORTH TURNER BRIDGE

Dissolved Oxygen - Biological Oxygen Demand

Date	FLOW MT/d	DISSOLVED OXYGEN ppm	T/d	Wk avg	B.O.D. 5 day 20°C ppm	T/d	Wk avg
August							
1	14.7	5.40	79.4		7.28	107.	
2	10.3	5.86	60.4	33.9	3.72	38.3	57.4
3	8.21	5.12	42.0		2.25	18.5	
4	7.40	4.80	35.5		3.25	24.1	
5	7.07	3.60	25.5		3.20	22.6	
6	7.16	3.50	25.1		4.07	29.1	
7*	6.53	3.92	25.6		4.01	26.2	
8	7.78	4.34	33.8		3.94	30.7	
9	6.97	3.35	23.3	30.1	5.26	36.7	26.8
10	6.99	3.80	26.6		3.15	22.0	
11	7.05	4.40	31.0		2.62	18.5	
12	6.26	2.90	18.2		4.69	29.4	
13	6.29	3.40	21.4		5.11	32.1	
14*	6.13	3.20	19.6		4.37	26.8	
15	6.86	3.00	20.6		3.63	24.9	
16	7.13	3.12	22.2	22.8	5.52	39.4	27.6
17	6.56	3.36	22.0		2.88	18.9	
18	6.89	4.25	29.3		2.65	18.3	
19	5.97	3.20	19.1		3.90	23.3	
20	6.94	3.08	21.4		3.78	26.2	
21*	6.05	2.76	16.7		4.60	27.8	
22	7.16	2.44	17.5		5.42	38.8	
23	6.97	1.70	11.8	19.7	9.21	64.2	31.1
24	7.40	2.48	18.4		5.93	43.9	
25	7.07	2.95	20.9		4.25	30.1	
26	6.43	2.00	12.9		7.36	47.3	
27	6.18	2.20	13.6		5.78	35.7	
28*	5.72	2.07	11.8		6.00	34.3	
29	6.29	1.95	12.3		6.21	39.1	
30	6.27	1.92	12.0	14.6	6.21	38.9	38.5
31	5.97	1.75	10.5		5.91	35.3	
Sept.							
1	6.21	2.85	17.7		3.44	21.4	
2	5.67	2.38	13.5		4.61	26.1	
3	5.97	2.60	15.5		4.06	24.2	
4*	5.54	3.22	17.8		5.31	29.4	
5	4.37	3.84	16.8		6.55	28.6	
6	6.48	5.10	33.0	17.8	3.84	24.9	27.1
7	6.29	2.70	17.0		8.03	50.5	
8	5.64	4.20	23.7		3.65	20.6	
9	5.16	3.28	16.9		4.41	22.8	
10	5.54	2.50	13.9		4.08	22.5	
11*	5.51	2.68	14.8		4.37	24.1	
12	6.83	2.85	19.5		4.65	31.8	
13	33.64	3.54	119.1	32.8	6.38	214.6	55.3
14		8.30			3.28		
15		8.78			3.35		

Table D.O.-B.O.D. #2

GULF ISLAND DAM

Dissolved Oxygen - Biological Oxygen Demand

Date June	FLOW MT/d	DISSOLVED OXYGEN ppm	T/d	Wk avg	Compns Wk avg	B.O.D. 5 day 20°C ppm	T/d	Wk avg	Compns Wk avg
15	9.96	0.69	6.87			3.68	36.7		
16	17.5	1.15	20.1			3.72	65.1		
17	22.8	0.14	3.19			4.36	99.4		
18	16.2	0.90	14.6			4.34	70.3		
19*	13.9	1.04	14.5			4.32	60.0		
20	12.7	1.18	15.0			4.29	54.5		
21	10.4	1.58	16.4	12.6		3.64	37.9	60.6	
22	8.70	1.64	14.3			2.21	19.2		
23	8.67	1.75	15.2			2.37	20.5		
24	8.40	0.92	7.73			1.69	14.2		
25	10.8	0.10	1.08			3.76	40.6		
26*	15.6	0.05	0.78			3.58	55.8		
27	14.2	0.00	0.0		2.32	3.39	48.1		36.7
28	10.9	0.00	0.0	5.58		3.70	40.3	34.1	
29	9.18	0.00	0.0			4.33	39.7		
30	8.83	0.75	6.62			2.08	18.4		
July									
1	8.99	0.00	0.0			3.56	32.0		
2	10.2	0.00	0.0			1.42	14.5		
3*	9.18	0.00	0.0			1.81	16.6		
4	9.88	0.00	0.0		0.96	1.81	17.9		22.4
5	13.1	0.00	0.0	0.95		2.20	28.8	24.0	
6	11.8	0.35	4.13			1.22	14.4		
7	10.3	0.25	2.58			3.18	32.8		
8	9.34	0.16	1.49			2.75	25.7		
9	8.32	0.15	1.25			3.72	31.0		
10*	7.83	0.12	0.94			2.90	22.7		
11	9.21	0.08	0.72		2.96	2.07	18.7		20.5
12	8.18	0.11	0.90	1.72		2.17	17.8	23.3	
13	7.59	0.20	1.52			2.22	16.8		
14	8.26	1.68	13.9			1.32	10.9		
15	7.70	1.10	8.47			2.37	18.2		
16	7.43	0.36	2.67			1.88	14.0		
17*	7.32	1.18	8.64			1.98	14.5		
18	7.34	2.00	14.7		5.49	2.08	15.3		17.8
19	8.07	0.11	0.89	7.26		2.01	16.2	15.1	
20	7.78	0.15	1.17			2.92	22.7		
21	8.32	0.23	1.91			2.81	23.4		
22	7.34	0.16	1.17			3.80	27.9		
23	7.53	0.24	1.81			2.90	21.8		
24*	6.53	0.20	1.31			2.40	15.7		
25	6.94	0.16	1.11		1.24	1.90	13.2		17.6
26	6.53	0.13	0.85	1.33		2.14	14.0	19.8	
27	7.21	0.12	0.87			1.89	13.6		
28	6.64	0.23	1.53			2.50	16.6		
29	7.02	0.17	1.19			2.13	15.0		
30	7.53	0.42	3.16			2.23	16.8		
31*	9.40	0.31	2.91			2.34	22.0		

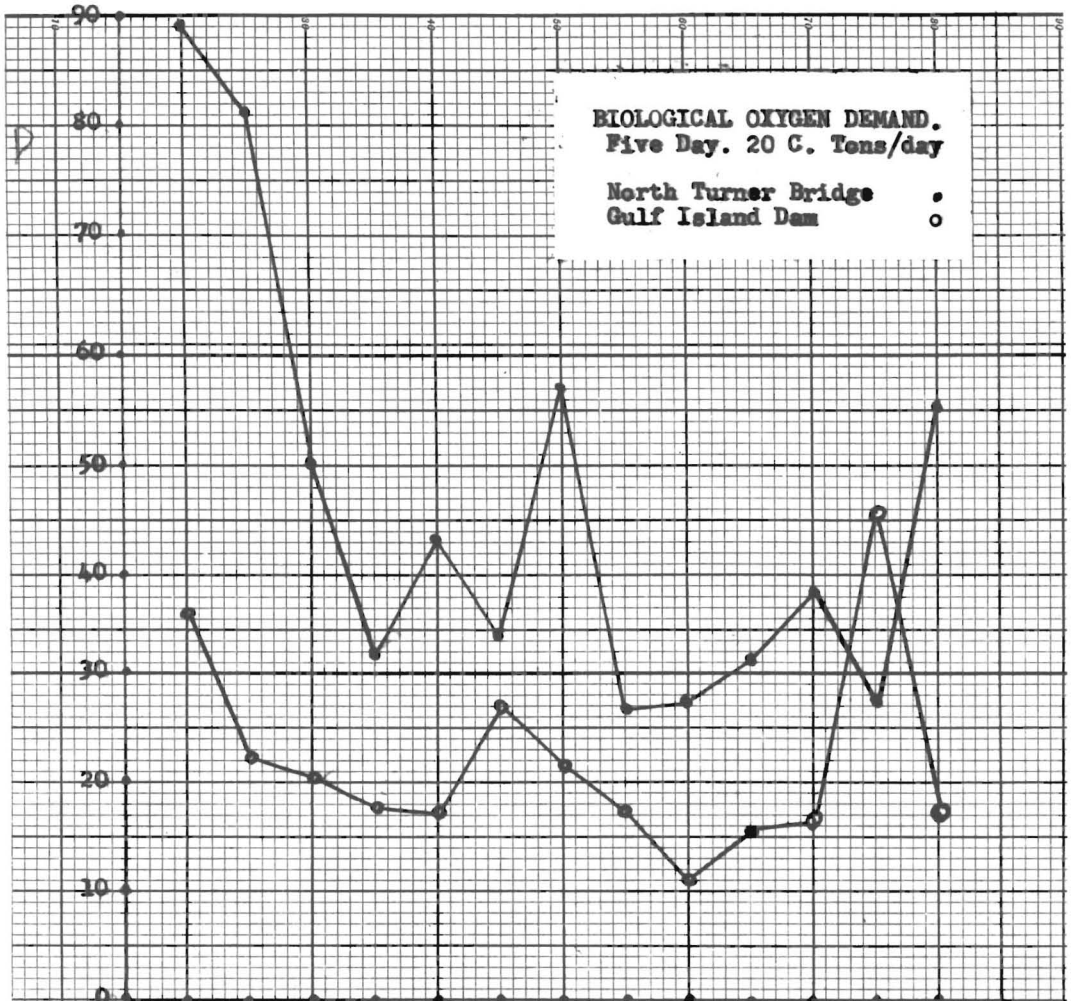
*Sunday calculated: Saturday plus Monday divided by two.

Table D.O.-B.O.D. #2 cont.

GULF ISLAND DAM

Dissolved Oxygen - Biological Oxygen Demand

Date	FLOW MT/d	DISSOLVED OXYGEN ppm	T/d	Wk avg	Compns Wk avg	B.O.D. 5 day 20°C ppm	T/d	Wk avg	Compns Wk avg
Aug.									
1	14.7	0.20	2.94		2.19	2.47	36.3		27.0
2	10.3	0.20	2.06	2.09		4.38	45.1	23.6	
3	8.21	0.24	1.97			3.56	29.2		
4	7.40	0.15	1.11			3.36	24.9		
5	7.07	0.16	1.13			3.70	26.2		
6	7.16	0.24	1.72			3.64	26.1		
7*	6.53	0.19	1.24			3.43	22.4		
8	7.78	0.14	1.09		1.08	3.22	25.1		21.6
9	6.97	0.12	0.84	1.30		2.96	20.6	24.9	
10	6.99	0.12	0.84			2.22	15.5		
11	7.05	0.10	0.71			2.16	15.2		
12	6.26	0.02	0.13			3.08	19.3		
13	6.29	0.11	0.69			3.75	23.6		
14*	6.13	0.13	0.80			3.29	20.2		
15	6.86	0.15	1.03		1.91	2.82	19.3		17.5
16	7.13	0.50	3.57	1.11		2.20	15.7	18.4	
17	6.56	0.80	5.25			2.40	15.7		
18	6.89	0.28	1.93			1.30	8.96		
19	5.97	0.48	2.87			2.18	13.0		
20	6.94	0.27	1.87			1.75	12.1		
21*	6.05	0.34	2.06			1.77	10.7		
22	7.16	0.40	2.86		3.79	1.80	12.8		11.0
23	6.97	1.29	8.99	3.69		1.52	10.6	12.0	
24	7.40	0.78	5.77			1.44	10.7		
25	7.07	0.30	2.12			1.03	7.28		
26	6.43	0.17	1.09			1.97	12.7		
27	6.18	0.18	1.11			2.10	13.0		
28*	5.72	0.14	0.80			2.40	13.7		
29	6.29	0.10	0.63		1.26	2.70	17.0		15.3
30	6.27	0.22	1.38	1.84		2.21	13.9	12.6	
31	5.97	0.53	3.16			2.27	13.6		
Sept.									
1	6.21	0.10	0.62			3.73	23.2		
2	5.67	0.36	2.04			2.76	15.6		
3	5.97	0.05	0.30			2.66	15.9		
4*	5.54	0.17	0.94			2.45	13.6		
5	4.37	0.28	1.22		0.91	2.24	9.79		16.7
6	6.48	0.10	0.65	1.28		2.93	19.0	15.8	
7	6.29	0.10	0.63			2.94	18.5		
8	5.64	0.10	0.56			4.34	24.5		
9	5.16	0.12	0.62			4.78	24,7		
10	5.54	0.32	1.77			2.42	13.4		
11*	5.51	0.25	1.38			2.69	14.8		
12	6.83	0.18	1.23		15.49	2.96	20.2		45.9
13	33.64	0.60	20.2	3.77		2.44	82.1	28.3	
14	41.77	0.60	25.1			2.68	111.9		
15	20.39	2.85	58.1			2.67	54.4		
16	11.8	3.60	42.5			2.37	28.0		
17	9.02	3.35	30.2			1.99	18.0		
18*	8.15	3.94	32.1			2.13	17.4		
19	7.70	4.52	34 8		34.4	2.26	17.4		17.0
20	7.24	4.56	33.0	36.5		1.80	13.0	37.2	
21	7.59	4.22	32.0			1.66	12.6		
22	8.53	4.28	36.5			1.45	12.4		


BIOLOGICAL OXYGEN DEMAND.
Five Day. 20 C. Tons/day
North Turner Bridge •
Gulf Island Dam o
90
80
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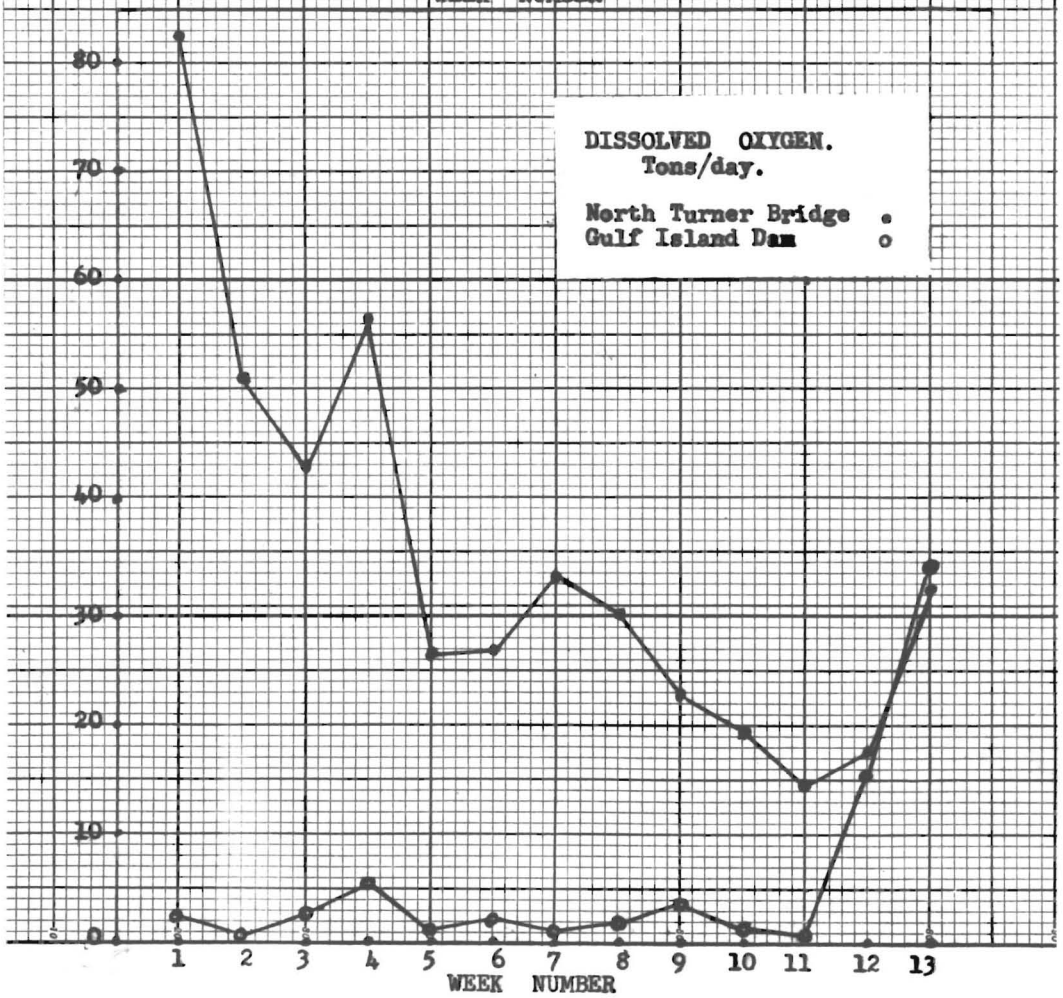
1 2 3 4 5 6 7 8 9 10 11 12 13
WEEK NUMBER


DISSOLVED OXYGEN.
Tons/day.
North Turner Bridge •
Gulf Island Dam o
80
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13
WEEK NUMBER

at the Rips just south of North Turner Bridge is not accurately known. A few tests made years ago indicated a pick-up of about two parts per million. With the average flows for the period about 2800 c.f.s. or 7.6 million tons per day, the reaeration at this location should be about fifteen tons per day.

This with a daily average of 32.8 tons of dissolved oxygen known to have entered and this fifteen tons of reaeration oxygen a total of about 47.8 tons were available for the 42.3 tons of B.O.D. This would indicate that the Benthal contribution was at least (15 ⁄ 7) twenty-two tons of five day B.O.D. per day.

The surface aeration in the Pool would approximate one ton of dissolved oxygen for each pound of oxygen absorbed per acre of surface. Some evidence places this surface reaeration at about ten pounds per acre per day. If this value is used then the Benthal contribution of five day B.O.D. should be (15 ⁄ 7 ⁄ 10) thirty-two tons per day.

Another approach to this problem would be to consider that the nine day time of passage should result in a ninety percent reduction of the ultimate B.O.D. of the pollution load entering the Pool. The ultimate B.O.D. is about 1.4 x B.O.D., 5 day. Thus 42.3 tons of five day B.O.D. would have an ultimate of 42.3 x 1.4 = 59.2 tons. Ninety percent of this is 53.3 tons. Therefore the average daily pollution load at North Turner Bridge would require 53.3 tons of dissolved oxygen per day for the satisfaction of ninety-per cent of the ultimate B.O.D.

Table 8#1

Weekly Summary B.O.D. - D.O. and O.D.*
Average Tons per Day

Week Number	N.T.B. B.O.D.	D.O.	O.D.*	G.I.D. B.O.D.	D.O.	O.D.**
1***	90.6	83.9	6.7	36.7	2.32	34.4
2	82.5	52.0	30.5	22.4	0.96	21.4
3	50.6	43.8	6.8	20.5	2.96	17.5
4	31.8	57.8	⁄26.0	17.8	5.49	12.3
5	43.2	26.7	16.5	17.6	1.24	16.4
6	33.2	26.9	6.3	27.0	2.19	24.8
7	57.4	33.9	23.5	21.6	1.08	20.5
8	26.8	30.1	⁄ 3.3	17.5	1.91	15.6
9	27.6	22.8	4.8	11.0	3.79	7.2
10	31.1	19.7	11.4	15.3	1.26	14.0
11	38.5	14.6	23.9	16.7	0.91	15.7
12***	27.1	17.8	9.3	45.9	15.5	30.4
13***	55.3	32.8	22.5	17.0	34.4	⁄17.4

*Oxygen Deficit

**Adjusted for average Time of Passage, nine days.

***Omitted from final calculations.

2 - 11 incl
42.3 32.8 -9.5

2 - 11 incl
16.7 2.15 -16.5

Table S#2

B.O.D. and D.O. Loss Benthal B.O.D.
Average Tons per Day

Week Number	B.O.D. Loss	D.O. Loss	B.O.D.* Benthal	B.O.D.** Benthal	B.O.D.*** Benthal
2	60.1	51.0	- 9.1	5.9	15.9
3	30.1	40.8	10.7	25.7	35.7
4	14.0	52.3	38.3	53.3	63.3
5	25.6	25.5	- 0.1	14.9	24.9
6	6.2	24.7	18.5	33.5	43.5
7	35.8	32.8	- 3.0	12.0	22.0
8	9.3	28.2	18.9	33.9	43.9
9	16.6	19.0	2.4	17.4	27.4
10	15.8	18.4	2.6	17.6	27.6
11	21.8	13.6	- 8.2	6.8	16.8
Average	23.5	30.6	7.1	22.1	32.1

* Statistical difference no allowance for reaeration.

**Includes average reaeration at N.T.B. only, 7.6 T/d, 2 PPm = 15.2

***Includes estimated total average reaeration in the Pool.

Long term B.O.D. determinations in the laboratory were erratic although 'normal' to the sixth or seventh day. The nine and ten day values indicate the factor for the passage through the Pool is somewhat closer to eighty percent than ninety percent of the ultimate B.O.D. at North Turner Bridge.

The total tons of the oxygen resources were, 32.8 ⁄ 15 ⁄ 10 or 57.8 leaving a net balance of 4.5 tons of oxygen; only 2.2 tons per day left the pool together with 18.7 tons of five day B.O.D. This method of calculation indicates an average daily Benthal contribution of about twenty tons.

Conclusion. The Benthal contribution to the water in the Pool approximates thirty-two tons per day when the conditions are considered as a continuous five day B.O.D. Of course the 'pick-up' is irregular both as to time and location.

Another approach to the problem is to consider the North Turner to Gulf Island average time (this ten week period) as nine days and consuming ninety percent of the ultimate B.O.D. passing North Turner. Calculations on this basis yields a somewhat lower figure of about twenty tons per day.

Laboratory Procedures

1. All dissolved oxygen tests were made by the Winkler Method, hypochlorite modification.

2. Biological oxygen demands were determined at 20°C, usually for five days. Standard dilution water was prepared according to A.P.H. standards using distilled water. Undiluted river water samples were incubated after the addition of one ml° of each of the standard nutrient solutions.

3. All other tests were conducted according to A.P.H. Standard Methods tenth edition.

° One ml/liter